

H947
v. 73
#3

PHYTOLOGIA

An international journal to expedite plant systematic, phytogeographical
and ecological publication

Vol. 73

September 1992

No. 3

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NEW YORK
BOTANICAL GARDEN

PHYTOLOGIA (ISSN 00319430) is published monthly with two volumes per year by Michael J. Warnock, 185 Westridge Drive, Huntsville, TX 77340. Second Class postage at Huntsville, TX. Copyright ©1991 by PHYTOLOGIA. Annual domestic individual subscription (12 issues): \$36.00. Annual domestic institutional subscription (12 issues): \$40.00. Foreign and/or airmail postage extra. Single copy sales: Current issue and back issues volume 67 to present, \$3.50; Back issues (previous to volume 67), \$3.00 (add \$.50 per copy postage and handling US [\$1.00 per copy foreign]). Back issue sales by volume: \$17.00 per volume 42-66 (not all available as complete volumes); \$21.00 per volume 67-present; add \$2.00 per volume postage US (\$4.00 per volume foreign). POSTMASTER: Send address changes to Phytologia, 185 Westridge Drive, Huntsville, TX 77340.

***CORNUS FLORIDA* SUBSP. *URBINIANA* (ROSE) RICKETT FROM
MEXICO: THE CORRECT NAME FOR "*C. FLORIDA* VAR. *PRINGLEI*"**

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ABSTRACT

Plants from disjunct populations of *Cornus florida* L. in México are appearing in the United States nursery trade under the illegitimate name "*C. florida* var. *pringlei*." The correct and legitimate name for this taxon is *C. florida* subsp. *urbiniana* (Rose) Rickett. New data are presented on morphological and flowering characteristics of the Mexican flowering dogwood to justify its subspecific status.

KEY WORDS: *Cornus*, Cornaceae, México

In a recent issue of the *American Nurseryman*, Lowrey (1990) described certain features of a very unusual flowering dogwood cultivated in Houston, Texas, that he named "*C. florida* var. *pringlei*." The "Pringle dogwood," a common name given by Lowrey (Lowrey 1990), now flowering in Texas and other locations as well, including the U.S. National Arboretum in Washington, D.C., originated from seed collected by Mr. Lowrey a number of years ago from a wild-occurring disjunct population of *C. florida* in the Sierra Madre Oriental mountains near Monterrey, Nuevo León State, México. This plant is now, or soon will be, entering the commercial nursery trade and be available to consumers.

The purposes of this paper are to: (1) show that the name or epithet "*pringlei*" is not valid at the level of species or variety, or any other botanical rank; (2) provide a valid botanical name at an appropriate rank for this Mexican flowering dogwood; and (3) describe and elaborate on the unusual characteristics of this taxon.

Application of correct botanical classification or identification (taxonomy) and the use of accurate and proper botanical names (nomenclature) are cornerstones of understanding essential to communication among and between



Figure 1. *Cornus florida* subsp. *urbiniana* (Rose) Rickett in México, Nuevo León State, Sierra Madre Oriental, near Monterrey. Photograph courtesy of Lynn Lowrey.

plant scientists, horticulturists, and nurserymen. Such communication is especially needed in the genus *Cornus* at the present time because of a renewed interest in the large bracted flowering dogwoods brought about by the discovery and rapid spread of the deadly dogwood anthracnose disease, which is now wreaking havoc among native United States populations of *C. florida* L. Santamour & Dudley (1992) recently presented a taxonomic and cytogenetic summary of *Cornus* to a group of plant pathologists and mycologists engaged in dogwood anthracnose research in order to increase their awareness and understanding of the extraordinary complexity of this genus. As new flowering dogwood germplasm is being sought, worldwide, for evaluation, disease testing, hybridization, and introduction to the nursery industry, we must assiduously guard against the misapplication and use of incorrect plant names before they become firmly entrenched in the parlance of the nursery trade and "popular" horticultural publications.

There never has been a properly described and validly published taxonomic plant entity called "*C. pringlei*" or "*C. florida* var. *pringlei*." All the standard references and appropriate floras have been consulted and checked. These names simply have never been published in a way that would grant them official taxonomic and nomenclatural status. Accordingly, these names should not be used for any living plants, cultivated or as they occur in natural wild habitats. The name "*C. pringlei*," however, does exist in the literature, but only as a *nomen nudum*, having been published without any of the information required by the *International Code of Botanical Nomenclature* (Greuter, *et al.* 1988) to establish and recognize the name.

Where, then, does the name "*pringlei*" come from? Cyrus Guernsey Pringle (1838-1911), a Vermonter, was an extraordinarily prolific and distinguished botanist and plant explorer. His explorations and collecting activity were concentrated primarily in México between 1885 and 1909, when he amassed nearly 16,000 herbarium collection numbers in multicats. By 1936, his collections were the basis of approximately 29 new genera, 1,200 new species and over 100 new varieties (*varietates* in the botanical sense) of plants indigenous to México. There is, indeed, adequate evidence that C.G. Pringle collected specimens of the unique Mexican *Cornus*, allied to *C. florida*, in the Sierra Madre Oriental above Monterrey, México, Nuevo León State. It was from this location, so many years later, that Frederick G. Meyer (retired taxonomist of the U.S. National Arboretum), Lynn R. Lowrey (presently at Anderson Landscape Services, Houston, Texas), and perhaps others, collected germplasm and introduced it into cultivation in the United States.

In an edited compilation of Dr. Pringle's field notes and diaries of his Mexican trips (Davis 1936), there occur several references to "*C. pringlei* Rose n. sp." On page 61 of the edited diaries, Pringle reported that on June 15, 1889 "I walked to the cañon of the Sierra Madre 10 miles to the southeast, collecting ... High in the cañon I also found *Cornus pringlei* Rose n. sp., a

tree eight to ten inches by 25 feet" Pringle did not provide in his diary an herbarium specimen collecting number for *C. pringlei*, as he did for other genera and species collected that particular day or as he did throughout his 24 - year diary. Later, from a site very close to the first collection on June 15 (or even from the same tree?), on August 23, 1889, Pringle wrote "Descending from the mountain we collect on the way *Cornus pringlei* Rose n. sp., a tree a foot in diameter and 25 feet in height...." Once again it is noted that the field collecting number is not cited. Then, in the "Classified List" (Davis 1936, p. 417) of Pringle's collections "*Cornus pringlei* Rose n. sp." is designated as Pringle collection number 2409, deposited *only* (authors' emphasis) in the Pringle Herbarium (University of Vermont, Burlington; VT). *Cornus florida* L. is also listed in the Davis (1936) "Classified List" as Pringle collection number 2409. In Davis's "Numerical List" of Pringle's collections Pringle No. 2409 is cited twice: first as *Cornus florida* L., without an herbarium of deposit indicated; and then secondly as "*Cornus pringlei* Rose n. sp. P.," the "P." indicating the Pringle Herbarium as the only institution of deposit.

Who, then, was this "Rose" indicated by Pringle in his 1889 Mexican diary: "*Cornus pringlei* Rose n. sp.?" Joseph Nelson Rose (1862-1928) was an eminent, and somewhat controversial, botanist at the Smithsonian Institution in Washington, D.C. Dr. Rose was, in fact, responsible, as the publishing authority, for a large number of Pringle's collections being recognized and published as new genera and new species. It can only now be deduced that Pringle's opinion about his collection No. 2409 vacillated between being *C. florida* and a new species, which Pringle himself designated as "*C. pringlei*," assuming and anticipating that Dr. Rose would name it after him, the original collector. However, Dr. Rose did not ever describe, name or publish the Mexican flowering dogwood after Dr. Pringle. This may well be because Dr. Rose possibly never saw or studied Pringle's collection No. 2409 from the Sierra Madre near Monterrey, México. Or, if Rose did see the Pringle 2409 collection, he may have decided not to describe it as a new species as no inflorescence bracts were present, and only very immature fruit were evident. This fact is well proven by the chapter "Pringle's Plants in Type Herbarium at the National Herbarium" (the National Herbarium is in the Smithsonian Institution Department of Botany; US) in Davis (1936). In May, 1992 the first author of this paper talked with Dr. David Barrington, Curator of the Pringle Herbarium in Burlington, Vermont and discovered that, indeed, a specimen of Pringle No. 2409 is deposited there (VT). The typical printed label of this collection states: "*Cornus pringlei* Rose n. sp.," and indicates the locality as México, Nuevo León State, Cañon Sierras, near Monterrey. This Pringle 2409 specimen is provided with an interesting annotation by the late L.A. Charette, a former curator of that herbarium in the 1960's, that indicated that "*Cornus pringlei* Rose" is a synonym of *Cornus florida* subsp. *urbiniiana* (Rose) Rickett, *Anales Inst. Biol. Univ. Nac. México* 21:92, 1950 (Rickett 1950). Charette

had apparently overlooked the 1945 validating publication of that combination, also by Rickett (1945). The first author of this paper discovered a duplicate specimen of *Pringle* 2409 collected on 23 August 1889, labeled *C. florida*, in the Gray Herbarium (GH) of the Harvard University Herbaria. This specimen had no inflorescence bracts, only developing fruit.

Although Dr. Rose did not name the Mexican flowering dogwood in the late 19th or early 20th centuries as "*Cornus pringlei*," he did finally describe, name, and publish the taxon as *Cornus urbiniiana* Rose sp. nov. in 1903 (Rose 1903), naming the new species for the collector "my good friend Dr. (Manuel) Urbina, acting director of the National Museum of México, by whom it was collected, and to whom I am under many obligations." He distinguished this new species from *C. florida* by its "much larger and comparatively narrow (involucral) bracts," pinkish, 5 cm long, 2 cm or more wide, tapering at the base. The type specimen chosen by Rose was collected by Manuel Urbina in April, 1891 in Vera Cruz State on Cerro de San Cristóbal near Orizaba, México, and the holotype was deposited in the type collection of the U.S. National Herbarium (US) at the Smithsonian Institution, Washington, D.C. A duplicate specimen (isotype) of this Urbina collection was deposited in the Herbario Nacional, México City; MEXU. It should be noted that this infraspecific taxon of *C. florida* apparently is represented in México by at least two separate populations: one in Nuevo León State, and the other in Vera Cruz State. Recent explorations indicate that it also occurs in Tamaulipas State (Fairey, pers. comm.).

Cornus urbiniiana Rose was reduced in rank from species status to *C. florida* var. *urbiniiana* by Wangerin (1910). Wangerin (1910) described his *C. florida* var. *urbiniiana*, called "Corona de Montezuma" and "Corona de San Pedro" locally in México, as distinct from typical North American *C. florida* by having oblong or narrowly obovate, "subchartaceous" involucral bracts with very short acuminate apices that are not at all cordate incised; these bracts are not spreading after anthesis but remain suberect and arcuate, convergent at the apices. In the literature of this Mexican taxon Wangerin (1910) is, then, the only authority prior to Lowrey (1990) to mention the unusual and novel character of the involucral bracts remaining erect throughout flowering with their apices "convergent:" this botanical term also meaning connivent (coming together) and adherent. However, under no circumstances are these bract apices fused or connate in any way as stated by Lowrey (1990). Temperate México is given by Wangerin (1910) as the natural distribution of *C. florida* var. *urbiniiana*, and he cited three herbarium specimens, two from Nuevo León State, and one from Vera Cruz State.

In a more recent taxonomic treatment of Mexican *Cornus*, Rickett (1945) regarded *C. urbiniiana* Rose as the basis and basionym for his *C. florida* subsp. *urbiniiana* (Rose) Rickett, comb. nov., with *C. florida* var. *urbiniiana* (Rose) Wangerin as a synonym. Five years later, Rickett (1950) again published the same new combination of subsp. *urbiniiana* (Rose) Rickett under *C. florida*.

However, the earlier Rickett article of 1945 has priority as the validating publication. In publishing the new subspecies combination Rickett (1945) mentioned the narrow, acute involucre bracts, the smaller number of flowers per inflorescence, and the reduced number of fruits per inflorescence cluster as minor, yet distinguishing, deviations from the "normal" *C. florida*. However, Rickett (1945) appeared to be unaware of the peculiar "fusion" or convergence, or adherence (to be explained below) of the involucre bract apices described and photographically illustrated by Lowrey (1990).

It is noteworthy that the "fusion" (apical coherence) of the involucre bracts of subsp. *urbiniana* is characteristic of all of the native plants observed by Lowrey (pers. comm.) in Nuevo León State as well as in plants cultivated in widely separated localities in the United States, grown from seed originally collected in Nuevo León and Vera Cruz States. These cultivated plants include all of those grown in Houston, Texas (Lowrey, pers. comm.), a plant (NA 57778) at the U.S. National Arboretum, Washington, D.C. (from Lowrey seed), a plant at the University of Washington Arboretum in Seattle from seed collected by F.G. Meyer on August 23, 1948 "along arroyo 6 mi. from Dulces Nombres in the Sierra Madre Oriental, Nuevo León State," and another plant (access. no. 865-48) growing at the University of Washington Arboretum in Seattle reported as having been grown from seed collected in Vera Cruz State.

It has been established that "*Cornus pringlei*" and "*C. florida* var. *pringlei*" are names without any official taxonomic and nomenclatural status, and that *C. florida* subsp. (or var.) *urbiniana* is the correct name for this plant. The question remains as to whether it should be named at the rank of variety (var.), or at the rank of subspecies (subsp.). Rickett (1945) based his categorization of *urbiniana* at the rank of subspecies on the fact of the geographic isolation of the Mexican population which is disjunct from the main body of the natural distribution range of *C. florida* var. *florida*, and the anomalous nature of the concepts and definitions of the term and rank of variety (*varietas*, pl. *varietates*) in the botanical literature of the time. For many years American and European botanists argued extensively and excessively about the terms "variety" and "subspecies," with the Americans, for the most part, resisting the term and botanical rank of "subspecies." It was probably Davis & Heywood (1965) who established criteria for these ranks on an international basis. The rank of subspecies is used in that book for geographically (and/or ecologically) isolated entities or populations which demonstrate some (at least three) correlated, distinct, and definable morphological character discontinuities. The term or rank of "variety" should be reserved for botanical taxa that may occur sporadically and randomly throughout a natural distribution of a species, and possess one to three definable morphological character differences. In the case of this Mexican flowering dogwood, which could be called "Urbina's dogwood," with unusual and consistent differential morphological characters that are consistently correlated with the natural geographic disjunction, the

use of the rank of subspecies (subsp.) is well justified.

There is the possibility, as yet not investigated, that in addition to a definite geographical disjunction *Cornus florida* subsp. *urbini*ana may be ecologically isolated to some extent, in that its natural habitat is in fairly dry limestone mountains. Lowrey (1990) commented that, because of this ecological factor, the plant "may adapt better to San Antonio, Texas and the Edwards Plateau than *C. florida*." However, based on the evidence of the thriving flowering tree of *C. florida* subsp. *urbini*ana at the U.S. National Arboretum, Washington, D.C. (USDA Hardiness Zone 7), this taxon successfully tolerates acidic and heavy clay soils.

As mentioned above, the involucre bracts of *Cornus florida* subsp. *urbini*ana from México are *not* "fused" as stated by Lowrey (1990). The tips of the bracts are, however, strongly adherent (or connivent, or coherent) from early development of the inflorescences and expansion of the involucre bracts (April in Washington, D.C.) through anthesis (the pollen shedding period) and present the "Chinese lantern" configuration described by Lowrey (1990). The following observations and measurements of *C. florida* subsp. *urbini*ana are based on a single, flowering tree growing at the U.S. National Arboretum (NA 57778), and on wild-collected and cultivated herbarium specimens deposited in the Herbarium of the National Arboretum (NA), studied in 1992. Comparisons with "normal" *C. florida* subsp. *florida*, when mentioned, are based on the cultivars 'Barton' and 'Cloud 9,' two popular and widely grown nursery selections. Careful examination of the tips of the bracts of subsp. *urbini*ana, under magnification, revealed the reason for this apical coherence or adherence. Ventrally, the bract apices are covered with a very dense white indumentum composed of slender, sinuous, and undulating hairs. Throughout the development of the inflorescence and bracts in the previous year the hairs of all bract apices are very tightly intermeshed and interlocked. The pressure exerted by the expanding narrow bracts of *C. florida* subsp. *urbini*ana is not sufficient to pull the hairs, and subsequently the bracts, apart. Conversely, the pressure exerted by the expanding, and much larger and wider bracts of *C. florida* subsp. *florida* is sufficient, for the most part, to separate their bract apices. Occasionally, the involucre bracts of some inflorescences of subsp. *urbini*ana do come apart naturally, but they remain "twisted" and are more or less erect, never flattened, horizontal, deflexed, or sometimes "floppy" as they are for subsp. *florida*. Coherence or adherence of bract tips has also been noted in plants of *C. florida* subsp. *florida* from many United States provenances when forced into flower, earlier than normal, in a polyhouse or greenhouse. When these plants flowered outdoors, the adherent bract trait disappeared. Mr. Fred Galle, former Director of Horticulture, Callaway Gardens, Pine Mountain, Georgia, has related (pers. comm.) that over 40 years ago he observed a number of 4 inch caliper trees of *Cornus florida* subsp. *florida* in private gardens in Knoxville, Tennessee that consistently displayed apically

"fused" involucre bracts.

The Galle observation of coherent inflorescence bract apices on *Cornus florida* subsp. *florida* is documented by an herbarium specimen in the Gray Herbarium (GH) of the Harvard University Herbaria: Tennessee, Knoxville, lawn on Terrace Avenue, W.W. Wyatt 17239, 27 April 1953 (GH). Another bract anomaly on *C. florida* subsp. *florida* demonstrated by Arnold Arboretum Accession 22791 (no longer living) of *C. florida* is documented by two herbarium specimens collected by Alfred Rehder: one on 11 May 1944; the other on 18 May 1948 (both A). This accession which was growing near the Jamaica Plain gate of the Arnold Arboretum had four bracted inflorescences, of which only two opposing ones were upright and incurved at their apices, and only a few of these erect narrow bracts were coherent at their apices. Rehder noted that this accession did not show any reduction of the number of flowers in the inflorescence.

It is obvious, and perhaps unfortunate, that the "Chinese lantern" feature (Lowrey 1990) caused by the coherence of the involucre bract tips is not a consistent diagnostic character displayed only by *Cornus florida* subsp. *urbini-ana*. It can be said, however, that apparently the coherent bract apices are the general rule, rather than the exception, for *Cornus florida* subsp. *urbini-ana*; whereas coherent bract tips for *C. florida* subsp. *florida* are the exception, rather than the general rule.

The involucre bracts of *Cornus florida* subsp. *urbini-ana* are much narrower in relation to width when compared to the "normal" bracts of "typical" *C. florida* subsp. *florida*. For subsp. *urbini-ana*, they average 5.2 cm long and 2.2 cm wide at anthesis; whereas those of subsp. *florida* are two to three times wider. While in the "Chinese lantern" configuration the involucre bracts of subsp. *urbini-ana* are strongly keeled (folded) ventrally, and even if they separate naturally, often by wind action, they remain keeled. The average number of flowers per each inflorescence was 17 for subsp. *urbini-ana* and 27 for the two cultivars of subsp. *florida*. The percentage of aborted pollen was higher (ca. 20%) for subsp. *urbini-ana* than normal (ca. 1%). The diameter of stained pollen grains of subsp. *urbini-ana* was 40 μ , slightly and insignificantly smaller than normal (43 μ). Some meiotic abnormalities were suspected to occur in subsp. *urbini-ana*, where 2-3% of the stained pollen ranged from 52.8 μ to 62.4 μ . These large, apparently viable, pollen grains probably had more than the normal gametic complement ($n = 11$) of chromosomes, and could give rise to progeny with more than the diploid ($2n = 22$) number of chromosomes.

A number of herbarium specimens deposited in the U.S. National Arboretum Herbarium (NA) were also studied, and are cited here for purposes of documentation. All of the "flowering" specimens of subsp. *urbini-ana* cited below demonstrate adherent or coherent bract apices. However, many of these coherent bract apices separate with senescence, a fact also observed on the living material growing of the U.S. National Arboretum.

MEXICO. Nuevo León State: Municipio de Villa Trinidad to Potrero Redondo, tree 1 ft x 40 ft., abundant along arroyo banks in dense pine-oak forest, *C.H. Mueller* 2945, August 23, 1939 (also examined at GH); *ibid.*, 11 mi. w. from El Cercado and junction with México highway 85 and 7 mi. from Horsetail Falls in the high Sierra Orientale, elev. 5300 ft., small tree, 7-8 m tall, d.b.h. 2-3 dm., single trunks, pine-oak forest, common locally along forest edge and lightly within, n. facing slope, fruits greenish with slight pink tinge, *W. Hess & G. Wilhelm* 4354, June 12, 1978.

CULTIVATED. UNITED STATES. Washington: University of Washington Arboretum, Seattle, deciduous small tree, 25 ft. tall, with cream white bracts, grown from seeds collected in México, Nuevo León State, along arroyo 6 mi. east of Dulces Nombres, Sierra Madre Oriental, coll. F.G. Meyer, August 23, 1948, *Joseph Witt*, May 31, 1966 (also examined at A); *ibid.*, Arboretum Accession No. 865-48, from Missouri Botanic Garden, St. Louis, seed collected near Vera Cruz, México, *Herbarium Committee Arboretum Foundation Unit Council*, June 6, 1975. District of Columbia: Washington, U.S. National Arboretum, NA Accession No. 57778, received as a 10 ft. plant from Dr. Allen G. Hirsh, American Red Cross, Bethesda, Maryland on June 3, 1986, "the *C. florida* collected by Lynn Lowrey, North Star Nursery, TX at Sierra Madre Oriental, Monterrey, México," *E.J. Garvey*, February 15, 1992; *ibid.*, *E.J. Garvey*, April 13, 1992; *ibid.*, tree single trunked at base, ca. 15 ft. tall, base diam. ca. 4 inches, trunk branches into 2 main stems 2 ft. from ground level, each stem ca. 2 inches in diam.; bark smooth, light brownish grey; leaves moderate yellowish green and somewhat lustrous above, light bluish green, dull and pubescent below; petioles yellowish green; flowers mostly yellowish green with light bluish green sepals; involucral bracts white, mostly adherent at tips, with age some bract tips separating, *A. Fournier*, May 12, 1992.

Additional herbarium specimens of *Cornus florida* subsp. *urbiniana* were studied at the Harvard University Herbaria, and are important to cite here.

MEXICO. Nuevo León State: Sierra Madre Oriental, northside of ridge above Puertos El Ceroado, 30 south of Monterrey, abundant in Arroyo, *C.H. & M.T. Mueller*, 13 May 1934 (A); *ibid.*, Municipio de Villa Santiago, Potrero Redondo west to Puerto a Lacuna Sanchez and beyond, abundant in cañon beyond west Puerto in dense oak woods, small tree up to 8" x 30', *C.H. Mueller* 2115, 5 July 1935 (A - orig. det. as *C. disciflora* DC. var. *floccosa* [Wang.] Standley); *ibid.*, mountains near Monterrey, *C.H. & M.T. Mueller*, July 1933 (A - orig. det. *C. disciflora* DC.); *ibid.*, below Alamar, about 15 m SW of Galeana, scattered in densely wooded waterway on canyon floor, *C.H. & M.T. Mueller* 1141, 21 July 1934 (A); *ibid.*, Dulces Nombres and east to the border with Tamaulipas, tree to 40 ft. tall, bark corrugated, in dense oak-pine woods, near stream course, 1550 meters alt., *F.G. Meyer & D.J. Rogers* 2602, 20 June 1948 (GH); *ibid.*, canyons of Sierra Madres near Monterrey, *C.G. Pringle* 2409, 23 August, 1889 (A). Vera Cruz State: Cerro de San Cristóbal

near Orizaba *locus classicus*, moist slope, 5000 ft, A.J. Sharp 4613, 8 March 1946 (GH); *ibid.*, 2/3 way up Cerro de San Cristóbal, 1/2 m south of Orizaba-*locus classicus*, elev. about 5000 ft., Wayne E. & Margaret S. Manning 53768, 4 August 1953 (GH); *ibid.*, Huatusco, C.A. Purpus 8933, March 1921 (GH).

Lynn Lowrey of Houston, Texas also arranged for us to examine a fruiting specimen of *Cornus florida* subsp. *urbiniana* deposited in the herbarium of the Robert A. Vines Environmental Science Center in Houston, Texas: MEXICO. Nuevo León, Monterrey, Chipinque, C.D. Peterson 1244, 24 July 1988 (SBSC).

Professor John G. Fairey of the Department of Architecture, Texas A&M University, College Station, Texas recently reported (pers. comm.) that in the autumn of 1990 he discovered a large number of 60 foot tall trees of this Mexican flowering dogwood in a cloud forest area, 7000 feet elevation, at "El Butano," a very remote and seldom visited giant sinkhole 50 miles southwest of Monterrey, Nuevo León State, northeast México. These trees were growing among *Ilex rubra* S. Watson and *I. discolor* Hemsley (also 60 feet tall), *Taxus globosa* Schlechter, *Picea martinezii* T.F. Patterson (a synonym of *P. chihuahuana* Martínez), and an evergreen *Quercus*.

Another large population of *Cornus florida* subsp. *urbiniana* is reported by Professor Fairey (pers. comm.), and consists of thousands of trees in Nuevo León State near La Trinidad at 4500 feet elevation. These trees have extremely large inflorescence bracts, nearly twice as large as those of typical *C. florida* in the United States, yet all are coherent at their apices. The fruits of these trees are also reported as being exceptionally large. Professor Fairey has also discovered (pers. comm.) scattered trees with "soft pink" inflorescence bracts in a remote locality approximately 60 miles NW of Ciudad Victoria in Tamaulipas State.

In summary, the correct botanical name for the Mexican flowering dogwood now being grown and promoted as "*Cornus florida* var. *pringlei*" is *C. florida* subsp. *urbiniana* (Rose) Rickett (1945). Whether it is logical to continue to call this plant the "Pringle dogwood" when it is really named in honor of Dr. Manuel Urbina is an issue that does not need to be resolved here.

Cornus florida L. subsp. *urbiniana* (Rose) Rickett, Bull. Torrey Bot. Club 72:223. 1945. BASIONYM: *Cornus urbiniana* Rose, Contrib. U.S. Nat. Herb. 8:53. 1903.

SYNONYMS: *Cornus pringlei* Pringle ex Davis, *Life and Work of Cyrus Guernsey Pringle*, pp. 61,65,417,505,721. 1936 - *nomen nudum et illegitimum*. *Cornus florida* L. var. *pringlei* (Pringle ex Davis) Lowrey, American Nurseryman 172 (6):142. 1990 - *nomen nudum et combinationes illegitimum*.

Cornus florida L. var. *urbiniana* (Rose) Wangerin, *Das Pflanzenreich* (ed. A. Engler) Heft 41. IV. 229:87. 1910. *Benthamidia florida* (L.)

Moldenke var. *urbiniana* (Rose) Moldenke, Revista Sudamer. Bot. 6:177. 1940. This identical combination was made by Hiroshi Hara eight years after Moldenke (cf. Hara 1948).

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DETERMINATIONS OF CHROMOSOME NUMBER (2N) AND
ENDOSPERM BALANCE NUMBER (EBN) IN SOME LITTLE KNOWN
TUBER BEARING *SOLANUM*

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ABSTRACT

Diploid chromosome numbers and endosperm balance numbers are reported for taxa of tuber bearing *Solanum*.

KEY WORDS: Solanaceae, *Solanum*, chromosome number, cytology

Solanum acroglossum Juz. (Bull. Acad. Sci. U.R.S.S. 3:313-314. 1937.):
 $2n=24$; EBN = 2.

Solanum albornozi Corr. (Wrightia 2:178. 1961.): $2n=24$; EBN = 2.

Solanum amayanum Ochoa (Amer. Pot. Jour. 66:1-4. 1989.): $2n=24$; EBN
= 2.

Solanum anamatophilum Ochoa (Ann. Cient. Univ. Agr., Lima. 2[4]:391-395.
1964): $2n=24$; EBN = 2.

Solanum antacochense Ochoa (Amer. Pot. Jour. 58[3]:127-129. 1981.): $2n=24$;
EBN = 2.

Solanum ayacuchense Ochoa (Agronomía, Lima. 26:312-313. 1959.): $2n=24$;
EBN = 2.

Solanum blanco-galdosii Ochoa (Ann. Cient. Univ. Agr., Lima. 11[3-4]:157-
160. 1973.): $2n=24$; EBN = 2.

Solanum buesii Vargas (Rev. Arg. Agron. Buenos Aires. 10:396-397. 1943.):
 $2n=24$; EBN = 2.

Solanum candolleianum Berth. (Ann. Sci. Agron., Paris, ser. 3. 2:185. 1911.):
 $2n=24$; EBN = 2.

Solanum cantense Ochoa (Agronomía, Lima. 26:217-218. 1959.): $2n=24$;
EBN = 2.

Solanum contumazaense Ochoa (Ann. Cient. Univ. Agr., Lima. 2[2]:148-151.
1964.): $2n=24$; EBN = 2.

Solanum chulhasense Bitt. (Lorentzia, Argentina) 4:9-11. 1981.: $2n=24$; EBN
= 2.

Solanum chiquidenum Ochoa (Biota, Lima. 1:5-7. 1954.): $2n=24$; EBN = 2.

Solanum dolichocremastrum Bitt. (Fedde Repert. Sp. Nov. 12:3-4. 1913.):
 $2n=24$; EBN = 1.

Solanum guzmanguense Whalen & Sagast. (in Whalen, M.D., Sagastegui A.,
& Knapp, S. Brittonia 38[1]:9-12. 1986.): $2n=24$; EBN = 1.

Solanum humectophilum Ochoa (Darwiniana 15([3-4]:550-553. 1969.): $2n=24$;
EBN = 1.

Solanum hypocrarthrum Bitt. (Fedde Repert. Sp. Nov. 11:367-368. 1912.):
 $2n=24$; EBN = 1.

Solanum immite Dun. (in A.DC., Prodr. 13(I):32. 1852.): $2n=24$; EBN = 1.

Solanum ingaefolium Ochoa (Agronomía, Lima. 26:319. 1959.): $2n=24$; EBN
= 1.

Solanum irosinum Ochoa (Amer. Pot. Jour. 58[3]:31-33. 1981.): $2n=24$; EBN
= 2.

Solanum jalcae Ochoa (Agronomía, Lima. 19:167. 1954.): $2n=24$; EBN = 2.

Solanum litusinum Ochoa (Phytologia 48[3]:229-232. 1981.): $2n=24$; EBN =
2.

Solanum lobbianum Bitt. (Fedde Repert. Sp. Nov. 12:446-447. 1913.): $2n=48$;
EBN = 2.

Solanum minutifolium Corr. (Wrightia 2:191. 1961.): $2n=24$; EBN = 1.

Solanum nemorosum Ochoa (Amer. Pot. Jour. 60[6]:389-392. 1983.): $2n=72$;
EBN = 4.

Solanum neovavilovii Ochoa (Amer. Pot. Jour. 60[11]:919-923. 1983.): $2n=24$;
EBN = 2.

- Solanum nubicola* Ochoa (Ann. Cient. Univ. Agr., Lima. 8[3-4]:143-146. 1970.): $2n=48$; EBN = 2.
- Solanum olmosense* Ochoa (Ann. Cient. Univ. Agr., Lima. 3[1]:33-37. 1965.): $2n=24$; EBN = 1.
- Solanum orophilum* Corr. (Wrightia 2:192-193. 1961.): $2n=24$; EBN = 2.
- Solanum pampasense* Hawkes (Bull. Imp. Bur. Pl. Breed. & Genet. Cambridge. 125. 1944.): $2n=24$; EBN = 2.
- Solanum paramoense* Bitt. (ex Pittier, Man. Pl. Usual. Venez. 329. 1926.): $2n=48$; EBN = 4.
- Solanum peloquinianum* Ochoa (Amer. Pot. Jour. 57[1]:33-35. 1980.): $2n=24$; EBN = 2.
- Solanum pillahuatense* Vargas (Las Papas Sudperuanas, Univ. Ncl. del Cusco. 2:53-54. 1956.): $2n=24$; EBN = 2.
- Solanum piurae* Bitt. (Beibl. Bot. Jahrb., No. 119. 54:5-6. 1916.): $2n=24$; EBN = 2.
- Solanum quillonanum* Ochoa (Phytologia 67[3]:235. 1989.): $2n=24$; EBN = 2.
- Solanum raquialatum* Ochoa (Agronomía, Lima. 19:172-174. 1954.): $2n=24$; EBN = 1.
- Solanum suffrutescens* Corr. (Wrightia 2:183-184. 1961.): $2n=24$; EBN = 2.
- Solanum tacnaense* Ochoa (Agronomía, Lima. 18[74]:133,135-136. 1953.): $2n=24$; EBN = 2.
- Solanum taulisense* Ochoa (Ann. Cient. Univ. Agr., Lima. 1[3]:216-220. 1963.): $2n=24$; EBN = 2.
- Solanum trinitense* Ochoa (Ann. Cient. Univ. Agr., Lima. 2[3]:245-247. 1964.): $2n=24$; EBN = 1.
- Solanum urubambae* Juz. (Bull. Acad. Sci. U.R.S.S. 2:312-313. 1937.): $2n=24$; EBN = 2.
- Solanum villuspetalum* Vargas (Las Papas Sudperuanas. Univ. Ncl. del Cusco. 2:54. 1956.): $2n=24$; EBN = 2.
- Solanum wittmackii* Bitt. (Fedde Repert. Sp. Nov. 12:546. 1913.): $2n=24$; EBN = 1.

**SOLANUM LOBBIANUM BITTER, A LITTLE KNOWN COLOMBIAN
TUBER BEARING SPECIES**

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ABSTRACT

New information and an expanded description are provided for the seldom collected *Solanum lobbianum*.

KEY WORDS: Solanaceae, *Solanum*, taxonomy

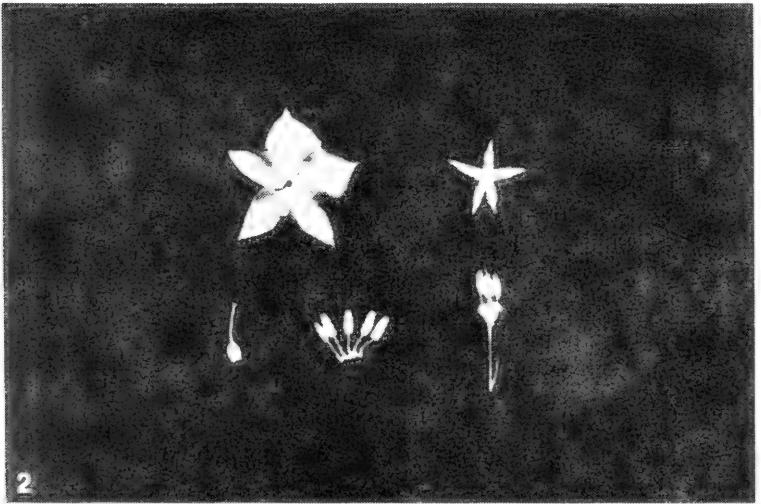
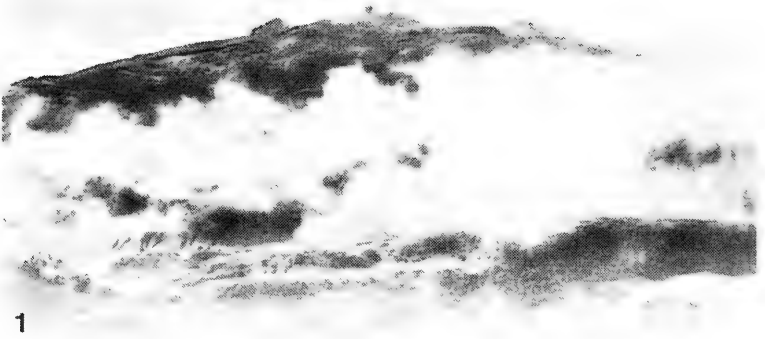
Solanum lobbianum was described by George Bitter in 1913 (Fedde Repert. Sp. Nov. 12:446.). The type of this wild tuber bearing potato species was collected circa 1856 by William Lobb, a British plant collector. However, Lobb failed to record his collection number, date of collection, and the exact location where collected. Its type specimen was housed in the *Hookerianum Herbarium* in 1867 with the simple label notation "Colombia, Lobb." This specimen, which represents the holotype of the species, is currently housed in Kew Gardens Herbarium in London.

In 1918, another collection of *Solanum lobbianum* was made by M.T. Dawe, under his number 742. This collection has three specimens which were distributed to herbaria at Kew, The New York Botanical Garden, and the National Herbarium of the United States of North America (Smithsonian). Dawe's specimens bear only a brief note indicating that they had been collected in "Ruiz, Colombia, 3000 m alt."

During my explorations in Colombia in July 1980—nearly 124 years after Lobb's first collection—I found *Solanum lobbianum* while ascending the volcano of El Ruiz, between Las Juntas and Termales, 2800-3200 m alt., Department of Manizales.

Although the original diagnosis of *Solanum lobbianum* is extensive and detailed, it was based on only one specimen. Here, I will give some complementary data that could be useful for a better understanding of this species.

Plant (15-)25-30(-40) cm tall, slightly rossulate at the base when growing in the open field under exposed conditions, densely pubescent, stoloniferous



1. El Ruiz Peak, near 5000 m alt., Colombia. Frontground in the low 3200 m alt., habitat of *Solanum lobbianum*.

2. Flower dissection of *Solanum lobbianum*

and tuber bearing. Stem usually branched, 3-5 mm in diameter, sparsely pilose, narrowly winged, wings straight and barely distinguishable, internodes (1.0-)2.5-4.5(-5.5) cm long. Leaves imparipinnate, 9.5-20.0 cm long by 6.5-16.0 cm wide, 3-5 pairs of leaflets, 3-8 pairs of sessile interjected leaflets, from two to three sizes, small suborbicular to orbicular; lateral leaflets widely elliptic to elliptic lanceolate, first and second upper pair 2.5-4.5 cm long by 1.7-2.5 cm wide, 2-7 mm petiolulate, obtuse or subacuminate apex, petiolules sometimes with 1-2 small interjected leaflets; the lower pair of leaflets much smaller and sessile. Pseudostipular leaves widely elliptic-lanceolate with the apex very obtuse, small, 7.0 x 5.0 mm. Inflorescence cymose, 7-9 flowered. Peduncle 3.5-7.0 cm long, 1.5-2.0 mm in diameter toward base, pilose as the pedicels, calyx and flower buds; hairs multicellular of unequal length sparsely alternated with short glandular tetralobed hairs; pedicels 18-22 mm long, articulated slightly above the middle. Calyx 7-11 mm in diameter, lobes narrowly lanceolate, acute. Corolla very pale violet or light violet-lilac with whitish acumens, rotate pentagonal or pentagonal, 1.6-2.0 cm in diameter, acumens densely pilose. Filaments 1.0-1.5 mm long, glabrous; anthers widely elliptic-lanceolate, small, 4 mm long. Style 7.0 mm long, covered with little prominent papillae toward the one-third of the basis; stigma shortly conical-capitate, small. Ovary conical. Fruit long conical.

Solanum lobbianum is a typical species of the series *Conicibaccata*, with a chromosome number of $2n=48$. Although *S. lobbianum* has some similarity with *S. bukasovii* Juz., and *S. brevicaule*, as Correll states (*The Potatoe and its Wild Relatives*, Texas Research Foundation. 1962.), it differs from these and from all known tuber bearing species because of its conspicuous pubescence, silvery-white hairs noticeably longer on the stem, calyx, and flower buds, peduncles shorter and thinner than in *S. bukasovii*, pedicels slender, corolla small (2.0-2.5 cm in diam.), very pale violet, fruits long conical. Contrary to *S. bukasovii* or *S. lobbianum* f. *multidissectum* (Hawkes) Correll, which in my opinion is only a variety of *S. bukasovii*, the corolla of *S. bukasovii* is pentagonal, larger (up to 4 cm or more in diameter), dark blue violet or dark purple, flower buds are not too densely pilose, nor are the hairs very long; fruit globose to ovate and its chromosome number is $2n=24$.

Specimens Examined: COLOMBIA. Dept. Manizales: Heights of Las Juntas, 2800 m alt., July 22, 1980, *C. Ochoa* 14109 (CIP,COL,GH). Above Termales, ascending towards volcano Ruiz, 3200 m alt., July 22, 1980, *C. Ochoa* 14110 (CIP,COL,GH). Indefinite: *Lobb* s.n. (HOLOTYPE: K). "Ruiz, 3000 m alt.", 1918, *M.T. Dawe* 742 (K,NY,US).

TAXONOMIC NOTES ON *ERIGERON* (ASTERACEAE: ASTEREAE) OF CALIFORNIA, NEVADA, AND ARIZONA

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ABSTRACT

In connection with taxonomic treatments of *Erigeron* from California, Nevada, and Arizona (submitted or in press), details are provided regarding some of the taxonomic decisions, most significantly those involving *E. lobatus* and *E. divergens*, *E. peregrinus*, the *E. eatonii* complex, *E. aphanactis*, and the taxa centered around *E. chrysopsidis*. Three new combinations are proposed (*E. eatonii* var. *nevadincola*; *E. eatonii* var. *sonnei*; *E. chrysopsidis* var. *austiniae*) and comments are provided regarding possible sectional realignments of species centered around *E. linearis*. New distribution records are reported for *E. lobatus* (first records for Nevada and California) and *E. pumilus* (first records for New Mexico).

KEY WORDS: *Erigeron*, Asteraceae, Astereae, California, Nevada, Arizona, New Mexico

Before the publication of relatively condensed taxonomic treatments of *Erigeron* L. for the states of California (51 species, 71 taxa in total, submitted for the developing Jepson's Manual), Arizona (submitted for the developing Flora of Arizona, 36 species, 38 taxa in total), and Nevada (33 species, 38 taxa in total, *Phytologia*—this issue), several associated taxonomic and nomenclatural problems need to be addressed in greater detail.

In addition, species described since Cronquist's revision of the North American species (1947) are now known from Arizona (Nesom & Roth 1981; Nesom 1989b, 1990c, 1990d) and California (Nesom 1992), concepts of Arizona taxa have been modified (Nesom 1989a), and a species previously known only from México has been recorded for the state (Nesom & Baker 1991). I am treating the North American species of *Erigeron* sect. *Trimorpha* (Cass.) DC. as the genus *Trimorpha* Cass. (Nesom 1989c). Some species variably treated in the

past as *Erigeron* or *Conyza* I recognize as *Conyza* (Nesom 1990a), while others I treat as the genus *Laennecia* Cass. (Nesom 1990b). *Erigeron ortegae* S.F. Blake (*Aster spinosus* Benth.) has been segregated as the genus *Chloracantha*, with a single species (Nesom *et al.* 1991; Sundberg 1991). A synopsis of the infrageneric taxonomy of *Erigeron* in North America is available (Nesom 1989d).

1. The *Erigeron foliosus* Nutt. group.

In his monograph of the North American species of *Erigeron*, Cronquist (1947) recognized six species and a total of eighteen taxa, including varieties, among the representatives of the *E. foliosus* group in the western United States. A recent treatment of this same group (Nesom 1992) recognizes fourteen species and a total of 28 taxa, including varieties. Of these, *E. oxyphyllus* E. Greene occurs only in Arizona and adjacent México; most of the rest of the taxa are centered in California.

2. *Erigeron algidus* Jeps.

The name *Erigeron petiolaris* E. Greene (Leaf. Bot. Observ. Crit. 2:205. 1912.) generally has been used for the monocephalous, high elevation species of California and Nevada, which is closely related to *E. simplex* E. Greene of the cordillera of the Southern Rocky Mountains. Greene's *E. petiolaris*, however, is a later homonym of *E. petiolaris* Vierh. (1906), a species of Siberia. The earliest available name for the North American species is *E. algidus* Jepson (*Man. Fl. Calif.* 1052. 1925.). *Erigeron simplex* was reported by Cronquist (1947) to occur in Nevada, but he cited no specimens from that state; Spongberg (1971) located no collections of *E. simplex* from Nevada. *Erigeron algidus* and *E. simplex* might be treated as varieties of a single species, but because of their morphological distinction and wide disjunction, they may be justifiably kept apart.

3. *Erigeron compositus* Pursh.

Several varieties have commonly been recognized within this species, based on leaf morphology (most commonly var. *compositus*, var. *discoideus* A. Gray, and var. *glabratus* Macoun; for others, see Cronquist 1945). Recent studies of cytogeography and molecular variation within *Erigeron compositus* (Beaman unpublished; Noyes *et al.* 1987; Noyes 1988) provide evidence that these traditional infraspecific categories are artificial and replace them with a detailed and presumably more natural system of classification. Until the publication of Beaman's formal system of nomenclature for these variants, I am treating the species without any formally recognized infraspecific elements.

4. *Erigeron lobatus* A. Nelson and *E. divergens* Torr. & Gray.

Erigeron lobatus is a distinctive species closely related to the Arizona endemic *E. piscaticus* Nesom and the widespread, primarily Mexican species *E. velutipes* Hook. & Arn. (Nesom 1989b). Some plants of *E. lobatus*, appear to be influenced by genes of *E. divergens*, but the two species for the most part maintain their own identity when occurring in close proximity. They are distinguished by the following contrasts.

- a. Stems and phyllaries minutely but densely and prominently stipitate glandular and very sparsely hairy with eglandular, straight, spreading hairs 0.5-2.0 mm long; basal and lower cauline leaves with deep lobes with rounded apices; phyllaries ovate-lanceolate, the margins thin hyaline; flowering December-May(-June, -September), in habitats at 1200-3800 ft (in Arizona). *E. lobatus*
- a. Stems and phyllaries densely and evenly pubescent with eglandular, spreading, often slightly crinkly hairs 0.1-1.0 mm long, sometimes also minutely granular glandular but the glandularity not prominent; basal and lower cauline leaves entire, or if lobed the lobes shallow to deep with acute apices; phyllaries lanceolate, the margins relatively thick; flowering (February-)April-October, in habitats at 3500-8050 ft (in Arizona).
 *E. divergens*

Erigeron lobatus is restricted to eastern Arizona and adjacent Sonora, México, except for one collection from Nevada and one from California, each the first report of the species from its respective state, and both very near the Arizona border. (1) Nevada, Clark Co., Valley of Fire, 11 Apr 1937, *Maguire 17874* (UT). This plant is slightly different from typical *E. lobatus* in its vestiture, mostly lacking conspicuous stipitate glands and producing a denser portion of eglandular hairs. In overall morphology, it is similar to *E. lobatus*, but it is perhaps genetically influenced by *E. divergens* and approaches the "accedens form" of *E. divergens* (see below). (2) California, San Bernardino Co., vicinity of Stepladder Mountains and Ward Valley, 20 mi E of Essex, 1800 ft, 14 May 1978, *Faulkner 608* (TEX,UCR). This collection is of typical *E. lobatus*.

A form of *Erigeron divergens* with persistent, deeply pinnatifid basal leaves with long petioles, elongated lower internodes, and a strong tendency toward perennality has been described both as *E. accedens* E. Greene and *E. californicus* Jepson (see citations below). The form is particularly distinctive in California, where *E. divergens* otherwise produces basal leaves that are mostly entire. I have annotated a number of specimens of the atypical form as the "accedens form" of *E. divergens*, although Jepson's name predates Greene's.

Such plants are commonly identified as *E. lobatus*, and they may be of hybrid origin between *E. divergens* and *E. lobatus*, but they are more similar in vestiture to *E. divergens*. They are found not only in the area where both putative parental species occur (primarily Arizona, where the "accedens form" is more abundant than elsewhere) but outside of it as well (central and southern California to Arizona, and much less commonly in New Mexico, trans-Pecos Texas, northern Sonora, and Chihuahua), and it seems likely that such plants have had a single origin. The plants of the "accedens form" for which chromosome counts are available all are triploid (and probably agamospermic) (from Arizona: Keil & Pinkava 1976; Pinkava & Keil 1977; Solbrig *et al.* 1969; from Texas and New Mexico, Turner & Zhao in prep.), although other more typical forms of *E. divergens* have also been reported as triploid. The "accedens form" is broadly sympatric with more typical *E. divergens* and is one of several morphotypes in the *E. divergens* complex that probably deserve formal taxonomic recognition at some rank.

Erigeron accedens E. Greene, Pittonia 4:155. 1900. TYPE: UNITED STATES. Arizona: Greenlee Co., Clifton, Apr 1899, Dr. A. Davidson s.n. (HOLOTYPE: ND-G!).

Erigeron californicus Jepson, Bull. Torr. Bot. Club 18:324. 1891. TYPE: UNITED STATES. California: Sutter Co., Marysville Buttes, [edge of the] summit of South Peak, 20 Apr 1891, W.L. Jepson s.n. (HOLOTYPE: JEPS!; Isotype: JEPS!).

5. *Erigeron multiceps* E. Greene.

The plants of the type collection (see below) are distinctively perennial, with thick, branching caudices, and the stem pubescence is upwardly ascending-appressed. Otherwise, in both floral and vegetative features, as noted by Cronquist (1947), the plants of *Erigeron multiceps* are very similar to the most common form of *E. divergens* in California. A number of collections of relatively typical *E. divergens* have been made in the immediate area of the type locality of *E. multiceps*, and if the latter is indeed distinct from *E. divergens*, it seems that it must be a rare species.

Plants of *Erigeron divergens* with appressed stem pubescence, though uncommon, have been collected from the southern part of its range (e.g., Esmeralda and Clark cos., Nevada; Cochise Co., Arizona). Similar variation occurs in other species of *Erigeron*, and a rarely occurring shift in the orientation of stem vestiture provides weak justification for segregating taxa, particularly as *E. divergens* is variable in other features as well. Field work is needed to clarify the identity of *E. multiceps* and its relationship to *E. divergens*, but until such is available, I have maintained the former as a separate species.

Erigeron multiceps E. Greene. Pittonia 2:167. 1891. TYPE: UNITED STATES. California: [Kern Co.], gravelly spots near river banks, N. Fork of the Kern River, 7-15 Jun 1888, *E. Palmer* [and Wright] 121 (LECTOTYPE [designated here]: ND-G!: Isolectotypes: NY!, US!, US photo-CAS!).

6. *Erigeron peregrinus* (Banks ex Pursh) E. Greene.

Cronquist (1947) regarded *Erigeron peregrinus* subsp. *callianthemus* (E. Greene) Cronq. as the southern segment of a widely distributed and variable species of western North America, with the typical subspecies occurring from the Aleutian Islands through Alaska and western Canada into Washington of the United States. Within subsp. *callianthemus*, var. *hirsutus* Cronq. of west central California and immediately adjacent Nevada appears to be weakly but justifiably maintained as a variety, but var. *scaposus* (Torr. & Gray) Cronq. and var. *angustifolius* (A. Gray) Cronq. can be recognized apart from the typical variety (var. *callianthemus* [E. Greene] Cronq.) only as arbitrarily distinguished and intergrading populations. These may be ecotypically differentiated in some areas, but they do not appear to represent coherent taxa with geographic integrity. Cronquist (1947) noted that var. *scaposus* occurs "approximately over the range of the subspecies," usually in alpine habitats. He placed the range of var. *angustifolius* from California and adjacent Nevada to British Columbia, also completely sympatric with the typical plants, though sometimes occurring to lower altitudes. While it does appear that plants with narrowly lanceolate to oblanceolate leaves, usually with acute apices, are most common in the Pacific states, they do not form a well differentiated group of populations that can justifiably be given formal taxonomic status. A study of variation within the two subspecies (*sensu* Cronquist) of *E. peregrinus* is underway (Nesom in prep.).

7. The *Erigeron eatonii* A. Gray complex.

In their study of *Erigeron eatonii* and allied taxa, Strother & Ferlatte (1988, p. 77) noted that all of the taxa treated by them "variously intergrade morphologically and may constitute a single, polymorphic species." Such a radical treatment would not be necessary, although I believe that two of the species recognized by them are better subsumed as varieties of *E. eatonii*: *E. sonnei* E. Greene and *E. nevadincola* S.F. Blake. Two new combinations are required:

***Erigeron eatonii* A. Gray var. *sonnei* (E. Greene) Nesom, *comb. nov.* BAsIONYM: *Erigeron sonnei* E. Greene, Pittonia 1:218. 1888. *Erigeron nevadensis* (sic) A. Gray var. *sonnei* (E. Greene) Smiley, Univ. Calif. Publ. Bot. 9:373. 1921. TYPE: UNITED STATES. California: Nevada**

and Placer counties, W. slope Washoe Mts., 22 Jul 1888, *C.F. Sonne* 2 (HOLOTYPE: ND-G!). See Strother & Ferlatte (1988) for comments on the typification.

***Erigeron eatonii* A. Gray var. *nevadincola* (S.F. Blake) Nesom, *comb. et stat. nov.* BASIONYM: *Erigeron nevadincola* S.F. Blake, *nom. nov.*, Proc. Biol. Soc. Wash. 35:78. 1922. Based on: *Erigeron nevadensis* A. Gray, Proc. Amer. Acad. Arts 8:649. 1873, *non* Wedd. 1857. TYPE: UNITED STATES. Nevada: Storey Co., Cedar Hill and Mt. Davidson, near Virginia City, 1863-64, *H.G. Bloomer s.n.* (LECTOTYPE [Cronquist 1947]: GH!).**

Cronquist also (pers. comm.) observed a close similarity between *Erigeron sonnei* and *E. eatonii* var. *plantagineus* (E. Greene) Cronq. In his 1947 study, he treated *E. sonnei* only as a synonym of var. *plantagineus*. In the key and comments of Strother & Ferlatte (1988), *E. sonnei* and var. *plantagineus* are separated essentially only by a greater, though overlapping, number of pappus bristles per achene in the former, and intermediates between the two occur at least in Sierra Co., California. With a number of specimens of both taxa at hand, var. *sonnei* can be seen as nearly intermediate in head size between typical var. *nevadincola* and var. *plantagineus*. My treatment of *E. nevadincola*, in turn, is based on its intergradation with *E. sonnei*.

Var. *nevadincola* is distinctive among the varieties of *Erigeron eatonii* in its large heads and corollas. *Erigeron sonnei* also is relatively large headed, compared to the rest of *E. eatonii*. An unpublished study of mine of the *E. nevadincola*-*E. sonnei* complex in Nevada (on file in the *E. eatonii* reprint folder at TEX) indicates that *E. sonnei* and *E. nevadincola* are morphologically intergrading and can be separated only arbitrarily, at least in the central part of Nevada. The characters studied were leaf length and width, head width, phyllary length, disc corolla length, style appendage length and shape, and pappus bristle number (my counts of pappus bristles include numerous plants of *E. sonnei* and *E. nevadincola* with up to 35 bristles per achene, in contrast to Strother & Ferlatte's maximum of "24+" bristles). Strother & Ferlatte (1988, p. 91) themselves observed that "These intergrading taxa [*E. sonnei* and *E. nevadincola*] are probably conspecific; we maintain them at specific rank for the present in order to preserve established nomenclature." In fact, *E. sonnei* has already been treated as a variety of *E. nevadincola*, but the combination is invalid, as it was based on an illegitimate later homonym, *E. nevadensis* A. Gray; further, if the two are considered conspecific and distinct from *E. eatonii*, the earliest correct name for the species is *E. sonnei* (1888) vs. *E. nevadincola* (1922).

On the east and north sides of the range of *Erigeron eatonii* var. *nevadincola*, closely related taxa are completely separated from it geographically

(Strother & Ferlatte 1988, Figs. 1 and 2), and there is no morphological intergradation between var. *nevadincola* and any of them. The connection of var. *nevadincola* with the rest of *E. eatonii* is only through *E. sonnei*.

Erigeron sonnei and var. *nevadincola* are more similar to each other than either is to var. *plantagineus*. Var. *nevadincola* and var. *plantagineus* are relatively clearly distinguished where they approach each other along the Nevada-California border, but Strother & Ferlatte (1988) noted the occurrence of "occasional plants" (unspecified) intermediate between them in Washoe Co., Nevada. They did not record the presence of var. *plantagineus* in Nevada, and my own observations are accordant with their Fig. 1, which shows var. *nevadincola* in California only in a small area of Sierra Co. and the adjacent southernmost portion of Lassen Co.

Cronquist (1947, 1955) and Munz (1959) both noted the occurrence of *Erigeron eatonii* var. *plantagineus* in Nevada, but the plants upon which these reports were based probably are those identified by Strother & Ferlatte as *E. sonnei*. Such observations, however, indicate the close similarity between var. *plantagineus* and *E. sonnei*. As treated here, the differences among the varieties of *E. eatonii* that occur in California and Nevada are strictly quantitative. Distinctions between other of the varieties involve size as well as variation in vestiture.

In treating other taxa of the *Erigeron eatonii* group, I have followed Strother & Ferlatte (1988) in considering *E. flexuosus* Cronq. merely a synonym of *E. lassenianus* E. Greene but note that the populations identified as the former apparently are completely disjunct from the range of typical *E. lassenianus*. As noted by Strother & Ferlatte, the disjuncts tend to produce a slightly different vestiture, and a more detailed study would be valuable in assessing whether they might deserve formal recognition at some rank.

8. *Erigeron concinnus* (Hook. & Arn.) Torr. & Gray.

This species was regarded by Cronquist (1947) as a subspecies of *Erigeron pumilus* Nutt. (as subsp. *concinoides* Cronq., with two varieties). A recent study (Nesom 1983) concluded that *E. concinnus* does not intergrade with *E. pumilus*, and the two are better recognized as distinct species. Study of additional collections has corroborated this, and the published distribution map (Nesom 1983, Fig. 1) remains essentially correct. The primary modification is the extension of the range of *E. pumilus* (var. *pumilus*) into north central New Mexico (several collections from Rio Arriba Co. - NMC, TEX, and UNM), a state from which that species has not been previously reported (Martin & Hutchins 1980).

Several collections of *Erigeron pumilus* var. *intermedius* Cronq. from the vicinity of Carson City, Nevada, are of thick stemmed, monocephalous, large leaved plants with highly abortive pollen. Similar plants also occur in Washoe

Co., Nevada, and adjacent Lassen Co., California. A triploid chromosome count ($2n=27$ univalents, *Raven 18545*-TEX, Solbrig *et al.* 1969) is known for such a plant from adjacent Storey Co., Nevada. Other chromosome counts from *E. pumilus* var. *intermedius* have been diploid ($n=9$ bivalents; Taylor & Brockman 1966; Semple 1985; Chinnappa & Chmielewski 1987; *Sundberg 1468*-TEX, apparently unpublished).

9. *Erigeron aphanactis* (A. Gray) E. Greene.

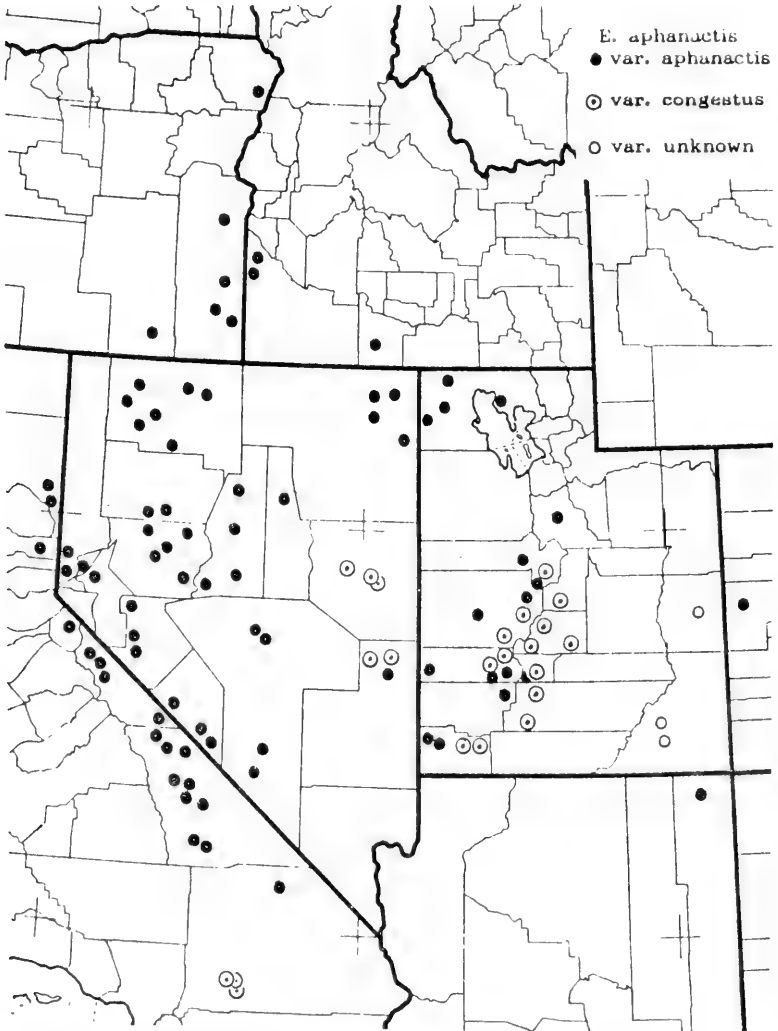
This species almost certainly is most closely related to those centered around *Erigeron pumilus* (Nesom 1989d, 1990d). This view is based in large part on the distinctive, reflexing ligules found in all of the taxa involved. The characteristically hairy disc corollas and the prominent, scaly, outer pappus of *E. aphanactis* are nearly identical to those found in the radiate *E. concinnus*. The geographic range and relative position of *E. concinnus* suggest, in contrast, that it is more closely related to *E. pumilus* (consisting of two varieties), all three taxa being derived from a widespread, evolutionarily fragmented, immediate ancestor (Nesom 1983, Fig. 1). *Erigeron concinnus* and *E. aphanactis* have broadly sympatric, nearly congruent ranges, and no unequivocal intermediates are known between *E. aphanactis* and any other species. The following nomenclatural paragraphs summarize my view, in agreement with Cronquist's, of the taxonomy of *E. aphanactis*:

Erigeron aphanactis (A. Gray) E. Greene, *Fl. Franc.* 4:389. 1897. *Erigeron concinnus* (Hook. & Arn.) Torr. & Gray var. *aphanactis* A. Gray, *Proc. Amer. Acad. Arts* 6:540. 1865. TYPE: UNITED STATES. Nevada: Carson City, 1864, *C.L. Anderson 205* (HOLOTYPE: GH!; Isotypes: MO!, NY!, US!).

Erigeron aphanactis (A. Gray) E. Greene var. *aphanactis*

Erigeron aphanactis (A. Gray) E. Greene var. *congestus* (E. Greene) Cronq., *Brittonia* 6:177. 1947. BASIONYM: *Erigeron congestus* E. Greene, *Leaflet Bot. Observ. Crit.* 2:218. 1912. TYPE: UNITED STATES. California: San Bernardino Co., Gold Hill, Bear Valley, 7000 ft, 2 Jun 1901, *S.B. Parish 4886* (HOLOTYPE: US!; Isotype: NY!).

The scapose, monocephalous plants of *Erigeron aphanactis* (var. *congestus*) occur primarily along the southeastern margin of the species (Map 1), although scattered, similar variants within populations may be found elsewhere. Similar variation in habit occurs within the closely related *E. concinnus*. *Erigeron pumilus* usually produces several heads per stem, and if it is assumed to be ancestral or phyletically coordinate with *E. aphanactis* and *E. concinnus*, the scapose habit is evolutionarily derived.



Map 1. Distribution of *Erigeron aphanactis*. Open symbols in southeastern Utah (Grand Co. and San Juan Co.) are added from Albee et al. (1988).

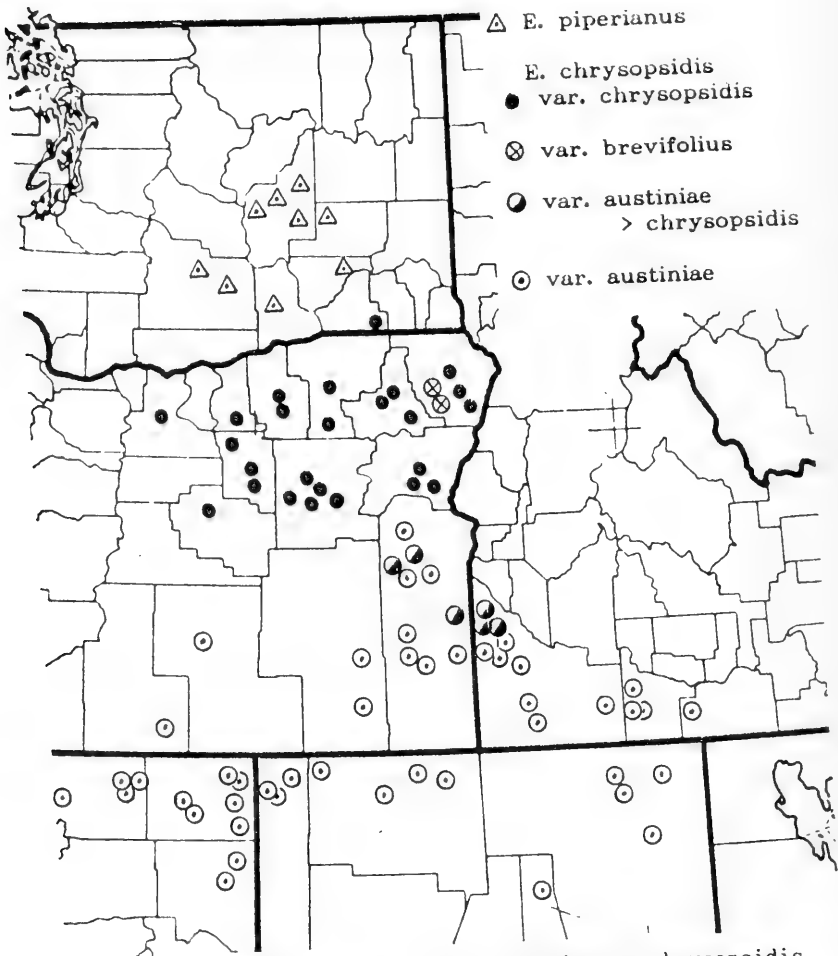
Erigeron concinnus is superficially very similar to *E. chrysopsidis* A. Gray var. *austiniae* (E. Greene) Nesom (see topic 10. below), particularly in the production of disciform heads, the pistillate flowers present but with extremely reduced ligules. This condition is not strictly homologous in these two species because *E. austiniae* E. Greene is apparently intimately related to a different group of species. Similar reduction of ligules also occurs in other, yet more distantly related, species of the genus.

10. The *Erigeron chrysopsidis* A. Gray complex.

My study of this complex is essentially in agreement with Cronquist's treatment of the same taxa, except for the provision of an additional taxonomic category for the southern segment of *Erigeron chrysopsidis*, which produces disciform heads. *Erigeron chrysopsidis* subsp. *chrysopsidis* (radiate) and subsp. *austiniae* (E. Greene) Cronq. (disciform) are allopatric and apparently closely related vicariads (Map 2). The latter might be maintained as a separate species, but in northwest Owyhee Co., Idaho, and in northern Malheur Co., Oregon, near the range of typical *E. chrysopsidis*, there are many plants, represented by numerous collections from different populations, with yellow, short ligules 1-3 (rarely 4) mm long. Elsewhere in the range of subsp. *austiniae* (E. Greene) Cronq., even the production of tiny ligules occurs only rarely. While these ligulate variants clearly belong with subsp. *austiniae* rather than with typical *E. chrysopsidis*, I cannot find any other character besides ligule length that would consistently distinguish them. Cronquist (1947) noted within one radiate population of *E. chrysopsidis* from Umatilla Co., Oregon, a rare tendency for the reduction of ligules parallel to that of subsp. *austiniae*. *Erigeron austiniae* is justifiably regarded as conspecific with *E. chrysopsidis*; I treat it as a variety in order to provide a category of coordinate rank with the other varieties of *E. chrysopsidis*. In the rest of the genus, "variety" is used as the primary taxonomic category to describe infraspecific variants.

Cronquist (1947) initially treated the plants of *Erigeron chrysopsidis* var. *brevifolius* Piper as a synonym of the typical element of *E. chrysopsidis*, but he later acknowledged their distinctive morphology and accepted their formal taxonomic recognition (1960; Hitchcock & Cronquist 1973). Although the differences of var. *brevifolius* from the typical variety are primarily quantitative, the former is easily distinguished and is restricted to the Wallowa Mountains of Wallowa Co., Oregon (Map 2), at high elevations (6100-10300 ft), whereas var. *chrysopsidis* occurs at 2800-4300(-6000) ft over its range. Intergrades exist but apparently are few, and more detailed study, including field observations, are needed for a more critical assessment of the nature of the relationship between the two taxa.

Keys that distinguish *Erigeron chrysopsidis* and *E. piperianus* (1947; Hitchcock & Cronquist 1973) have relied primarily on differences in stem vestiture



Map 2. Distribution of *Erigeron chrysopsidis* and *E. piperianus*.

and in size of heads and plants. With a greater range of specimens available for comparison, it can now be seen that these putative morphological differences between *E. chrysopsidis* var. *brevifolius* Piper and *E. piperianus* are considerably overlapping. Both are separated from typical *E. chrysopsidis* by a tendency for the stem hairs to be appressed and by a reduction in head and flower size. Compared to var. *brevifolius*, however, *E. piperianus* has leafier stems and the stem indument lacks the minute Type B trichomes and stipitate glands (Type C trichomes) commonly produced by *E. chrysopsidis*.

There are four yellow rayed species of North American *Erigeron*: *E. chrysopsidis*, *E. piperianus*, *E. linearis* (Hook.) Piper, and *E. aureus* E. Greene. If it is acknowledged that *E. chrysopsidis* and *E. piperianus* are sister species, there are three yellow rayed lineages, each apparently independently derived from white or blue rayed ancestors. *Erigeron linearis* may be closely related to *E. chrysopsidis* and *E. piperianus* (see notes below, topic 11), but they are not derived from an immediate common ancestor.

Following is a formal nomenclatural summary and key to *Erigeron piperianus* and the varieties of *E. chrysopsidis*.

Erigeron piperianus Cronq., Brittonia 6:197. 1947. TYPE: UNITED STATES. Washington: Grant Co., sagebrush slopes N of Soap Lake in Grand Coulee, 18 May 1935, J.W. Thompson 11490 (HOLOTYPE: NY!; Iso-types: GH!, LL!, MO!, RM!, TEX!, US!).

Erigeron chrysopsidis A. Gray

Chrysopsis hirtella DC., Prodr. 5:327. 1836. TYPE: UNITED STATES. [probably Oregon]: Columbia River, [ca. 1826,] D. Douglas s.n. (deCandolle cited only the Douglas collection, "v.s. comm. ab hon. soc. hort. Lond.;" photo DS!, photo and fragment UC, *fide* Cronquist 1947). *Erigeron ochroleucus* Nutt. var. *hirtellus* (DC.) A. Gray, Proc. Amer. Acad. Arts 16:90. 1880. *Erigeron chrysopsidis* A. Gray [nom. nov.], Syn. Fl. N. Amer. 1(2):210. 1884 (not *E. hirtellus* DC. 1836.). *Erigeron curvifolius* Piper [nom. nov.], Bull. Torrey Bot. Club 27:396. 1900. The proposal by Piper of a second nomen novum for deCandolle's species apparently reflected both a misunderstanding of the nomenclatural code and a misidentification of the species. The plants Piper associated with his concept of *E. chrysopsidis* were those later named by Cronquist (1947) as *E. piperianus*. The type of *E. chrysopsidis* is not mapped (Map 2) or precisely known, as Douglas apparently collected at many sites along the Columbia River, including areas where the species is known to occur.

Erigeron chrysopsidis A. Gray subsp. *chrysopsidis*

Erigeron chrysopsidis A. Gray subsp. *chrysopsidis* var. *chrysopsidis*

Erigeron chrysopsidis A. Gray subsp. *chrysopsidis* var. *brevifolius*
Piper, Bull. Torrey Bot. Club 27:395. 1900. TYPE: UNITED STATES. Oregon: [Wallowa Co.,] subalpine ridge of the Wallowa Mts. near the [Wallowa] Lake, 29 Jul 1899, *W.C. Cusick* 2270 (HOLOTYPE: WS; Isotypes: GH!, MO!, NY!).

Erigeron chrysopsidis A. Gray subsp. *austiniae* (E. Greene) Cronq., Brittonia 6:196. 1947. BASIONYM: *Erigeron austiniae* E. Greene (below)

***Erigeron chrysopsidis* A. Gray subsp. *austiniae* var. *austiniae* (E. Greene) Nesom, *comb. et stat. nov.* BASIONYM: *Erigeron austiniae* E. Greene, Erythea 3:100. 1895. TYPE: UNITED STATES. California: Modoc County, Davis Creek, May 1894, *Mrs. R.M. Austin s.n.* (LECTOTYPE [designated here]: ND-G!; Isolectotypes: NY!, PH, UC).**

Key to the taxa of the *Erigeron chrysopsidis* group

- a. Ligules of ray flowers completely absent or inconspicuous and not or barely exceeding the involucre; longest phyllaries 4.5-6.0 mm long; disc corollas 3.5-4.5 mm long; stem pubescence spreading. var. *austiniae*
- a. Ligules of ray flowers well developed and conspicuously exceeding the involucre; phyllary and corolla length various; stem pubescence variable. (b)
 - b. Longest phyllaries 5.0-6.5(-7.5) mm long; disc corollas 3.0-4.5 mm long; ligules (6-)8-11 mm long; stem pubescence spreading. var. *chrysopsidis*
 - b. Longest phyllaries 3.5-5.5 mm long; disc corollas 2.5-4.5 mm long; ligules 4-7 mm long; stem pubescence appressed to ascending appressed or spreading, the hairs of even length or markedly uneven. (c)
- c. Leafless portion of the stem 1/3-1/2 the total stem length; longest phyllaries 3.5-4.0 mm long; disc corollas 2.5-3.0 mm long; Columbia River plains at ca. 900-1300 feet elevation, southeastern Washington. *E. piperianus*

- c. Leafless portion of the stem $3/4-7/8$ the total stem length; longest phyllaries 4.0-5.5 mm long; disc corollas 2.5-3.5 mm long; rocky slopes and cliffs at 6000-10,300 feet, Wallowa Mountains of Wallowa Co., Oregon.
 var. *brevifolius*

11. Composition of *Erigeron* sect. *Osteocaulis* Nesom.

As noted in the discussion below, this group may prove to be more inclusive than I have defined it previously, or, alternatively, it may be possible to discern a close relationship among several of the species groups I have delimited as sections. In the strict sense, sect. *Osteocaulis* should include only the three species with petioles strongly developed into white cartilaginous, narrowly cylindrical sheaths on the lower stems: *Erigeron linearis*, *E. elegantulus* E. Greene, and *E. barbellulatus* E. Greene. The rayless *E. bloomeri* A. Gray probably belongs here also, based on its similarity in habit and vestiture, although its petiole bases are abruptly broadened and not cylindrically sheathing. *Erigeron compactus* S.F. Blake, *E. consimilis* Cronq., and two other species have been provisionally placed in sect. *Wyomingia* (Nesom 1989; 1991) but probably are more closely related to *E. bloomeri* and the core of sect. *Osteocaulis*. The species of the "*E. corymbosus* Nutt. group" of sect. *Asteroidea* Nutt. (sensu Nesom 1989d) also may be closely related to these, as may the species of sect. *Spathifolium* Nesom. Most of these species produce a characteristic indument of very small, closely appressed hairs. The only remaining species of *Erigeron* with a similar vestiture, those of sect. *Wyomingia* (A. Nels.) Cronq., may also belong with this group; their branching stems and multinerved achenes are probably evolutionarily specialized, as also implied by Cronquist (1947).

The two other species originally placed in sect. *Osteocaulis* (Nesom 1989d), the yellow rayed *Erigeron chrysopsidis* and *E. piperianus*, have petiole bases abruptly expanded and white indurated but not sheathing like those of *E. linearis*. Plants similar to *E. chrysopsidis*, with similar petiole bases as well as glandular stems with spreading hairs and petioles with coarsely ciliate bases, are also found in the species of the "*E. radicans* Hook. group" of sect. *Asteroidea* (Nesom 1989). *Erigeron chrysopsidis* may be more closely related to these latter taxa than to *E. linearis* and its closest relatives.

The placement of the "*Erigeron pumilus* group" within *Erigeron* remains problematic. Although the plants are very similar in habit to those of the "*E. radicans* group," the sharply reflexing (vs. apically coiling) ligules of *E. pumilus* suggest the existence of a different lineage, and Nesom (1990d) has placed these species with a primarily Mexican group as part of sect. *Geniculactis* Nesom. In southeastern Utah, on rare plants of the essentially rayless *E. aphanactis*, short ligules are produced on the ray flowers, and these can be seen to reflex, marking the affinity of *E. aphanactis* with *E. pumilus* rather than the superficially similar *E. chrysopsidis* var. *austiniae*.

ACKNOWLEDGMENTS

I thank Dr. B.L. Turner for his review of the manuscript and the staffs of CAS, ND-G, NSMC, NY, and UNM for loans of specimens. Specimens cited from other herbaria (GH, MO, RM, and US) have been observed on previous trips or in previous studies.

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ERIGERON AND TRIMORPHA (ASTERACEAE: ASTEREA) OF NEVADA

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ABSTRACT

Thirty four species of *Erigeron* are recorded from the state of Nevada. A key to the species is provided as well as an ecological and distributional summary for each species. One species of *Trimorpha*, *T. lonchophyllus*, is known from Nevada.

KEY WORDS: *Erigeron*, *Trimorpha*, Asteraceae, Astereae, Nevada

Compared to California, Arizona, and Utah, the known composition of the species of *Erigeron* L. in Nevada has changed but little since Cronquist's taxonomic revision of the genus for North America (1947). The study by Tidestrom (1925) is the only one available that provides a treatment bringing the Nevada taxa into narrower focus. The present study provides a key to the Nevada species of *Erigeron*, places on record the geographic distribution by county as well as the habitat and flowering period of each taxon within the state, and serves to update the taxonomy, particularly in parallel with that of neighboring California (Nesom submitted) and Arizona (Nesom submitted), both of which share a number of taxa with Nevada. Discussion of some of the taxonomic decisions are given in a separate paper (Nesom 1992b), particularly where they differ from those previously accepted.

I have segregated *Erigeron* sect. *Trimorpha* (Cass.) DC. as the genus *Trimorpha* Cass. (Nesom 1989). Only one species of *Trimorpha* (*T. lonchophyllus* [Hook.] Nesom) occurs in Nevada, and it is included for convenience in the key and summaries below.

Artificial key to the species of *Trimorpha* and *Erigeron*

- A. Phyllaries commonly 3 nerved; ligules filiform, up to 0.5 mm wide; pappus bristles lengthening at maturity to longer than the involucre.
..... *Trimorpha lonchophyllus*
- A. Phyllaries usually 1 nerved; ligules broader, usually 1-2 mm wide; pappus bristles not lengthening at maturity, not longer than the involucre. ...
..... *Erigeron* (1)
- 1. Cauline leaves neither clasping nor subclasping. (6)
- 1. Cauline leaves clasping to subclasping (slightly auriculate to covering half the stem diameter). (2)
 - 2. Involucre conspicuously pubescent, the hairs with black crosswalls in the basal cells; rhizomes long and slender; rays white. *E. coulteri*
 - 2. Involucre glandular but otherwise glabrous or only sparsely hairy; rhizome short and thick if present; rays blue or purple to white or pink. (3)
- 3. Rays more than 150, with filiform ligules (less than 0.6 mm wide); phyllaries minutely glandular as well as hairy; peduncles usually conspicuously dilated immediately below the heads; leaves usually shallow crenate. *E. philadelphicus*
- 3. Rays 30-80, with broader ligules (mostly 1.5-4.0 mm wide); phyllaries glandular, without other hairs; peduncles not dilated; leaves usually entire. (4)
 - 4. Stems and leaves prominently glandular; phyllaries imbricate to subequal; rays white to pink, rarely bluish, sharply deflexing with maturity. *E. nauseosus*
 - 4. Stems and leaves mostly eglandular; phyllaries equal to subequal; rays blue to purple, usually coiling at the tips with maturity. . (5)
- 5. Stems closely short strigose beneath the heads, glabrous to very sparsely villous below that, arising from a thick, fibrous rooted, lateral rhizome; phyllaries with loosely spreading or reflexed apices; ligules 2-4 mm wide; achenes 4-7 nerved. *E. peregrinus*
- 5. Stems glabrous to sparsely and minutely glandular, arising from a woody, usually erect caudex; phyllaries with relatively stiff, erect apices; ligules ca. 1 mm wide; achenes 2-4 nerved. *E. speciosus*

6. Pistillate flowers present, with conspicuous, well developed ligules.
..... (12)
6. Pistillate flowers lacking (in *E. inornatus* the outer hermaphroditic flowers sometimes may produce abortive stamens and short ligules) or if present, ligules lacking or only slightly to not exceeding the disc. (7)
7. Pubescence appressed from base of stem to apex. *E. bloomeri*
7. Pubescence spreading, at least near the base of stem. (8)
 8. Pistillate flowers present, the ligules absent or greatly reduced. (10)
 8. Pistillate flowers absent. (9)
9. Stems 0.5-1.6 dm tall; basal tuft of leaves present at flowering, large and usually 3 nerved; pappus bristles 15-25. *E. ovinus*
9. Stems 1-9 dm tall; basal leaves absent at flowering; pappus bristles 25-60.
..... *E. inornatus*
 10. Leaves ternately dissected or lobed. *E. compositus*
 10. Leaves entire. (11)
11. Stems leafy or merely bracteate, usually branched and bearing more than one head, sometimes monocephalous in Lincoln and Mineral cos., hirsute, minutely but conspicuously stipitate glandular; disc corollas prominently hairy; pappus bristles 7-20, outer pappus of narrow squamellae or conspicuous setae; carpodium whitish. *E. aphanactis*
11. Stems scapose, unbranched and monocephalous, hirsute, eglandular; disc corollas glabrate; pappus bristles 15-25; outer pappus of inconspicuous setae; carpodium distinctly yellowish. *E. austiniiae*
 12. Stems with appressed or closely ascending pubescence, sometimes glabrous. (25)
 12. Stem pubescence spreading, at least above. (13)
13. Leaves entire or shallowly pinnately lobed. (15)
13. Leaves 1 to 4 ternately dissected. (14)
 14. Caudex simple or with thick branches; leaves 1 to 4 ternate; phyllaries in 3-4 series; ligules usually less than 1 mm wide. *E. compositus*
 14. Caudex with several or numerous slender, rhizomelike branches; leaves 1 ternate; phyllaries in 2(3) series; ligules 1-2 mm wide. ...
..... *E. vagus*

- 15. Plants perennial with woody taproot or fibrous roots.(17)
- 15. Plants annual or short lived perennial with slender taproots.(16)
 - 16. Stems sparsely pilose with hairs 1-3 mm long, at least on lower part; basal leaves conspicuously lobed, petioles often greater than two thirds the leaf length.*E. lobatus*
 - 16. Stems moderately hirsute with hairs less than 1 mm long; basal leaves entire to toothed, petioles less than two thirds the leaf length.*E. divergens*
- 17. Plants (10-)20-55 cm tall with numerous, relatively evenly distributed cauline leaves; basal cluster of leaves absent at flowering. ...*E. breweri*
- 17. Plants 2-25 cm tall (up to 30 cm in *E. algidus*) with reduced cauline leaves; basal cluster of leaves persistent.(18)
 - 18. Plants with fibrous roots; rays often enrolling at the tips at maturity.*E. algidus*
 - 18. Plants with a taproot; rays straight or sharply deflexing at maturity.(19)
- 19. Ray flowers 10-50; disc corollas without a strongly inflated or indurated portion; outer pappus essentially lacking or of inconspicuous squamellae.(21)
- 19. Ray flowers 50-110; disc corollas strongly inflated and indurated in the lower third of the tube; outer pappus of conspicuous scales, squamellae or setae.(20)
 - 20. Disc corollas scabrous-puberulent with sharp pointed trichomes; pappus bristles 5-15; outer pappus of very broad scales or squamellae.*E. concinnus*
 - 20. Disc corollas glabrous to sparsely pubescent with blunt tipped trichomes; pappus bristles 12-22; outer pappus of shortened bristles, narrow squamellae, or a combination of the two.*E. pumilus*
- 21. Leaf blades hairy but eglandular or inconspicuously glandular.(23)
- 21. Stems and leaf blades heavily and conspicuously glandular as well as hairy.(22)
 - 22. Stems scapose, pubescent with hairs 0.3-0.7 mm long; involucre 4-7 mm high; ligules 4-7 mm long.*E. pygmaeus*

22. Stems leafy or bracteate, pubescent with hairs 1.0-2.2 mm long; involucre 7.5-10.5 mm high; ligules 7-10 mm long. *E. latus*
23. Caudex usually simple, sometimes with a few short, thick branches; basal leaves entire or rarely toothed, prominently 3 nerved. *E. jonesii*
23. Caudex usually conspicuously branched; basal leaves entire, 1 nerved (rarely and inconspicuously 3 nerved in *E. clokeyi*). (23)
24. Plants 1-5 cm tall; stems scapose, appressed pubescent on the lower half, woolly immediately below heads; leaves appressed pubescent. *E. uncialis*
24. Plants 2-20 cm tall; stems leafy or bracteate, all spreading pubescent, not woolly below heads; leaves spreading pubescent. (25)
25. Taproot and caudex branches slender; leaves spatulate to oblanceolate with the blade clearly differentiated from the petiole. . *E. asperugineus*
25. Taproot and caudex branches thick; leaves oblanceolate with the blade slightly or not at all differentiated from the petiole region. .. *E. clokeyi*
26. Leaf bases white cartilaginous, cylindrically enclosing the lower portion of the stem; ligules yellow. *E. linearis*
26. Leaf bases greenish, or if whitish not cartilaginous and enclosing the stem as a cylinder; ligules blue, purple, white, or pink. .. (27)
27. Plants annual; heads first produced on scapiform stems, later on leafy, spreading runners. *E. flagellaris*
27. Plants perennial; all heads produced on erect stems, no runners produced. (28)
28. Plants densely caespitose; stems scapose; achenes glabrous except along the two ribs. *E. compactus*
28. Plants much less compact in habit; stems leafy or bracteate; achene faces sparsely to densely pubescent. (29)
29. Stems finely strigillose, whitish toward the base because of much denser pubescence there; leaves linear to filiform. *E. filifolius*
29. Stems with pubescence of nearly equal density from top to base; at least basal leaves oblanceolate to obovate. (30)
30. Plants with an obvious taproot or root-caudex system with a long central axis; leaf blades strigose, hirsute, or glabrous to glabrate. (32)

- 30. Plants with caudex of slender branches, lacking a taproot or root/caudex system with a long central axis; leaf blades glabrous or very sparsely strigose. (31)
- 31. Caudex branches producing fibrous roots; stem base purplish; phyllaries green, equal to subequal, glandular and usually with a few hairs; ligules often coiling at the tips at maturity. *E. ursinus*
- 31. Caudex branches not producing fibrous roots; stem base green; phyllaries purplish, imbricate, glandular but without other hairs; ligules sharply deflexing at maturity. *E. leiomerus*
 - 32. Leaf blades strigose or hirsute; phyllaries in 3-4 series, strigose or hirsute. (34)
 - 32. Leaf blades glabrous to glabrate; phyllaries in 1-2 series, glandular, otherwise with few or no hairs. (33)
- 33. Plants with taproot and a simple or slightly branched caudex; branches decumbent-ascending; ligules 4-6 mm long, white to pink. . *E. watsonii*
- 33. Plants with long, slender caudex branches; branches erect-ascending; ligules 6-11 mm long, blue or rarely white. *E. leiomerus*
 - 34. Plants 3-15 cm tall; involucre 6-12 mm wide (pressed), 3.5-5.0 mm high; disc corollas 2.7-4.2 mm long. *E. tener*
 - 34. Plants 9-40 cm tall; involucre 10-20 mm wide (pressed), 5.5-10 mm high; disc corollas 3.8-6.5 mm long. (35)
- 35. Stems light green at the base; basal leaves 1 nerved, silvery strigose; phyllaries strongly unequal, densely and closely appressed pubescent; ligules often coiling at the tips at maturity; achenes 6-8 nerved. *E. argentatus*
- 35. Stems often purplish at the base; basal leaves 3 nerved, greenish, usually hirsute, less commonly strigose; phyllaries subequal to unequal, villous-hirsute; ligules remaining straight at maturity; achenes 2(-3) nerved. .
 *E. eatonii*

Trimorpha lonchophyllus (Hook.) Nesom

Douglas, Elko, Esmeralda, Eureka, Humboldt, Lyon, Mineral, Nye, Washoe, and White Pine cos.; 4500-9000 ft, moist or wet soil in meadows or along creeks, sagebrush up to yellow pine and subalpine, June-September. Alaska south to

British Columbia and Quebec, south in the western U.S.A. to California, Arizona, and north central New Mexico.

1. *Erigeron albidus* Jepson [*E. petiolaris* E. Greene; non Vierh., 1906]

Washoe Co. (Mt. Rose); ca. 9500-10500 ft. rocky meadows, alpine or near timberline, July-August. Sierra Nevada of southeastern California.

2. *Erigeron aphanactis* (A. Gray) E. Greene

A. Stems leafy, with several heads. var. *aphanactis*

A. Stems scapose, monocephalous. var. *congestus*

Erigeron aphanactis (A. Gray) E. Greene var. *aphanactis* [*E. concinnus* (Hook. & Arn.) Torr. & Gray var. *aphanactis* A. Gray]

Carson City, Churchill, Douglas, Elko, Esmeralda, Eureka, Humboldt, Lander, Lincoln, Lyon, Mineral, Nye, Pershing, Storey, Washoe, and White Pine cos.; (4000-)4500-9500 ft, dry, sandy or rocky soil, greasewood, sagebrush, pinyon-juniper, or yellow pine, April-September. Southwestern Colorado, western New Mexico, northern Arizona, Utah, southeastern Oregon, and California.

Erigeron aphanactis (A. Gray) E. Greene var. *congestus* (E. Greene) Cronq.

Lincoln and White Pine cos.: ca. 4500-6000 ft, dry sandy habitats. May-September. Southern California to south central Utah.

3. *Erigeron argentatus* A. Gray

Clark, Elko, Esmeralda, Eureka, Lincoln, Nye, and White Pine cos.; 5500-8500 ft, ridges and slopes in dry, sandy or gravelly soil, sagebrush, mountain mahogany, juniper, or pinyon-juniper, May-July. Western Utah and Inyo Co., California.

Erigeron utahensis A. Gray was reported by Munz (1959) to occur in Nevada, but no collections have been observed during this study. It is similar to *E. argentatus*, differing most conspicuously by having basal leaves deciduous or withered by flowering time and 4(-6) nerved achenes. If present, it would be

expected in Clark Co., adjacent to its locality in the Providence Mts. of San Bernardino Co., California. Elsewhere, it occurs in southern Utah, northern Arizona, and southwestern Colorado.

4. *Erigeron asperugineus* (D.C. Eat.) A. Gray

Elko and White Pine cos.; 7000-10300 ft, rocky or gravelly, often dry slopes, sagebrush or meadow edges, July-August. Central Idaho.

5. *Erigeron bloomeri* A. Gray [*E. bloomeri* A. Gray var. *pubens* Keck]

Carson City, Churchill, Douglas, Elko, Humboldt, Lander, Lyon, Mineral, Nye, Pershing, Washoe, and White Pine cos.; 4900-8400(-9700) ft, dry, sandy or rocky soil, sagebrush, sagebrush-mountain mahogany, pinyon-juniper, or yellow pine, May-July. Central Washington, Idaho, and northern California. All Nevada plants are var. *bloomeri*, which is highly variable in the amount of its involucre indument; the var. *nudatus* (A. Gray) Cronq. occurs in southwestern Oregon and northwestern California.

6. *Erigeron breweri* A. Gray

A complex species occurring from Oregon through California and Nevada into northern Baja California. Two of the seven varieties occur in Nevada.

A. Involucre hispidulous and glandular; phyllaries relatively narrow, long acuminate, without evident *Aster*-like green tips. ... var. *porphyreticus*

A. Involucre merely glandular; at least the inner phyllaries relatively broad, abruptly acute or acuminate, usually with *Aster*-like green tips.
 var. *breweri*

Erigeron breweri A. Gray var. *breweri*

Carson City, Douglas, Mineral, and Washoe cos.; 5900-9500 ft, open, rocky sites, June-September. East central to southeastern California.

Erigeron breweri A. Gray var. *porphyreticus* (M.E. Jones) Cronq.

Douglas, Esmeralda, Humboldt, Lander, Lyon, Mineral, Nye, Pershing, and Washoe cos.; 4500-9000(-10200) ft. dry, rocky soil or commonly in crevices or on ledges, sagebrush, pinyon-juniper, or yellow pine, May-September. South-eastern California. Intermediates are common between the two varieties; the key characters do not appear to be strongly correlated in their presence.

7. *Erigeron chrysopsidis* A. Gray

Elko, Eureka, Humboldt, and Washoe cos., 4900-6730 ft, gravelly soil, sagebrush or juniper, May-June. Southwestern Idaho, southeastern Oregon, and northeastern California. All Nevada plants are var. *austiniae* (E. Greene) Nesom [*E. austiniae* E. Greene]; these also comprise *E. chrysopsidis* subsp. *austiniae* (E. Greene) Cronq.; subsp. *chrysopsidis* comprises two varieties from Oregon and Washington (Nesom 1992b).

8. *Erigeron clokeyi* Cronq.

Clark, Esmeralda, Lander, Lyon, Mineral, Nye, and White Pine cos.; 8000-11500 ft, dry, rocky habitats, sometimes with sagebrush or mountain mahogany, common in treeless areas but often with yellow, bristlecone, or limber pine, June-September. Beaver Co., Utah, and eastern California.

9. *Erigeron compactus* S.F. Blake

Elko, Esmeralda, Eureka, Nye, and White Pine cos.; 4800-7200 ft, dry, sandy or rocky soil, sagebrush or pinyon-juniper, May-June. Northwestern Utah and Inyo Co., California. *Erigeron consimilis*, which has been considered a variety of *E. compactus*, is justifiably recognized as a separate species (Nesom 1991).

10. *Erigeron compositus* Pursh [*E. compositus* Pursh var. *glabratus* Macoun; *E. compositus* Pursh var. *discoideus* A. Gray]

Douglas, Elko, Humboldt, Lander, Mineral, Nye, Washoe, and White Pine cos.; 6000-11300 ft, rocky or gravelly habitats, often talus, sagebrush or mountain mahogany at lower elevations, May-September. Alaska and Greenland south to British Columbia and Quebec, California, and in the Rocky Mountains to Colorado and northern Arizona. Plants identified as var. *discoideus* A. Gray, with the largest leaves mostly once ternate, sometimes with an extra pair or small lobes below the larger ones, are known only from the Snake Range of White Pine Co. and the Toiyabe Mts. of Nye Co., but plants with typically 2-3 ternately divided leaves also occur in these areas. Previously recognized taxa based solely on leaf morphology apparently are artificial (see Nesom 1992b for further comments).

11. *Erigeron concinnus* (Hook. & Arn.) Torr. & Gray

- A. Stems conspicuously leafy, branched and several headed, (4)7-15(-24) cm tall. var. *concinnus*
 A. Stems scapose or nearly so, monocephalous, 3-9(-15) cm tall.
 var. *condensatus*

Erigeron concinnus (Hook. & Arn.) Torr. & Gray var. *concinnus* [*E. pumilus* Nutt. subsp. *concinoides* Cronq.]

Clark, Elko, Esmeralda, Eureka, Lincoln, Nye, and White Pine cos.; 3400-8000 ft, dry soil, greasewood-blackbrush, sagebrush), or pinyon-juniper, April-June(-August). Southeastern California (Inyo and San Bernardino cos.), southeastern Idaho, southwestern Wyoming, Utah, northern Arizona and New Mexico, and western Colorado.

Erigeron concinnus (Hook. & Arn.) Torr. & Gray var. *condensatus* D.C. Eat.

Clark, Elko, Eureka, Lincoln, and White Pine cos. but particularly abundant in the latter; Elko, Lincoln, Nye, and White Pine cos.; 5200-7900 ft, sagebrush, juniper, and pinyon-juniper, May-July. Northwestern New Mexico, central Utah, and Wyoming. Var. *condensatus* is not well defined geographically, and intermediates between it and var. *concinnus* are common.

12. *Erigeron coulteri* Porter

Carson City, Douglas, and Washoe cos.; 6200-10000 ft, moist or marshy areas in subalpine meadows or along stream banks, July-September. The population system in e.-central California, including the adjacent Douglas Co. plants, apparently is significantly disjunct from the main range of the species: northeastern Oregon, n. Idaho to Wyoming, northeastern Utah, Colorado, and northern New Mexico.

13. *Erigeron divergens* Torr. & Gray

Carson City, Clark, Douglas, Esmeralda, Eureka, Lincoln, Lyon, Nye, Storey, Washoe, and White Pine cos.; 200-7400(-8800) ft, meadows or disturbed sites, saltbush, blackbrush, sagebrush, pinyon-juniper, or yellow pine, late April-August(-September). Widespread in the western U.S.A.: western North Dakota, South Dakota, to British Columbia, south to California, Arizona, New Mexico, and southwestern Texas; northwestern México.

14. *Erigeron eatonii* A. Gray

- A. Phyllaries distinctly granular glandular; achenes 1.7-2.4 mm long.
 var. *eatonii*
- A. Phyllaries hairy but not at all glandular; achenes 2.8-3.2 mm long.
 (B)
- B. Phyllaries 7.0-10.5 mm long, 4.7-6.6 times longer than wide;
 ray floret lamina 7-11 mm long; disc florets 4.4-6.8 mm long. .
 var. *nevadincola*
- B. Phyllaries 4.5-8.0 mm long, 3.8-5.5 times longer than wide;
 ray floret lamina 4.5-6.6(-8.5) mm long; disc florets 3.5-5.0 mm
 long. var. *sonnei*

Erigeron eatonii A. Gray var. *eatonii*

Clark Co., where known from a single collection (*Tiehm 11256*, NSMC!) in the Virgin Mts. near the Utah border; 7400 ft, rocky slopes with *Cercocarpus*, May-June. Utah and north central Arizona to Colorado, Wyoming, south central Montana and southeastern Idaho.

Erigeron eatonii A. Gray var. *nevadincola* (S.F. Blake) Nesom [*E. nevadincola* S.F. Blake]

Carson City, Douglas, Elko, Eureka, Humboldt, Lander, Lyon, Nye, Pershing, Storey, and Washoe cos.; 4800-8700(-10000) ft, gravelly or rocky soil, sagebrush or pinyon-juniper, April-July(-September). Lassen and Sierra cos., California.

Erigeron eatonii A. Gray var. *sonnei* (E. Greene) Cronq., *ined* [*E. sonnei* E. Greene]

Lyon, Nye, and Washoe cos.; 5950-9250 ft, open, grassy or rocky habitats, often with sagebrush, May-September. Adjacent east central California.

15. *Erigeron filifolius* Nutt.

Carson City, Humboldt, and Washoe cos.; 5800-7700 ft, dry, rocky or sandy soil, sagebrush, bitterbrush, juniper, or yellow pine, June-August. Eastern California, Washington, Oregon, Idaho, northern Utah, northwestern Montana, and southern British Columbia. All Nevada plants are var. *filifolius*; the var. *robustior* Peck occurs in south central Washington and north central Oregon. Attribution of the epithet's authorship solely to Nuttall (Cronquist 1947) is justifiable.

16. *Erigeron flagellaris* A. Gray

Clark and Nye cos.; 7200-8300 ft, meadows or grassy slopes, often moist, commonly with yellow pine, June-July. South Dakota, Wyoming, disjunct in southern British Columbia, south to Arizona and southwestern Texas; northern México. Some of the plants of the large sample represented by *Clokey* 7746 (Clark Co.) have spreading or ascending rather than appressed stem pubescence. They are best represented taxonomically as *E. flagellaris*, but the variation probably reflects genes introgressant from *E. divergens*.

17. *Erigeron inornatus* (A. Gray) A. Gray

Washoe Co., 5000-6400 ft, dry, rocky habitats, often in sandy soil, July-September. Southeastern Washington, Oregon, and northern and southeastern California. All Nevada plants are var. *inornatus*; two other varieties occur in California. Peculiar variants in this species and possible hybrids with *Erigeron breweri* occur in Washoe Co. (Nesom 1992a).

18. *Erigeron jonesii* Cronq.

Elko, Lincoln, Nye, and White Pine cos.; 6000-10800 ft, rocky, rocky, sandy, or loamy soil on open, grassy slopes, often with sagebrush or mountain mahogany, sometimes pinyon-juniper, May-August(-September). Western Utah and Oneida Co. in southeastern Idaho.

19. *Erigeron latus* (Nels. & Macbr.) Cronq.

Elko Co. (northern part); 5200-6700 ft, gravelly soil or rock outcrops with sagebrush, June-July. Owyhee Co. in southwestern Idaho.

20. *Erigeron leiomerus* A. Gray

Elko, Lincoln, Nye, and White Pine cos.; 8600-11200 ft, rocky or gravelly habitats, June-September. Southern Idaho, Wyoming, western Colorado, northern Utah, and north central New Mexico.

21. *Erigeron linearis* (Hook.) Piper

Elko, Humboldt, and Washoe cos.; 4450-7300(-8700) ft, dry, rocky or gravelly soil, usually sagebrush or bitterbrush, May-July(-August). Eastern California, Washington, Oregon, western Wyoming and Montana, and southern British Columbia.

22. *Erigeron lobatus* A. Nels.

Valley of Fire in Clark Co.; 2000-2500 ft, sandy soil, March-April. Southern and western Arizona, southeastern California; northwestern México (Sonora).

23. *Erigeron nauseosus* (M.E. Jones) A. Nels.

Snake Range of White Pine Co., and Panaca (Pioche) Hills of Lincoln Co.; (5500-)8500-11500 ft, dry, rocky or sandy soil, talus, or cliff ledges or crevices, pinyon-juniper, oak, or spruce and aspen, May-August. West central Utah.

24. *Erigeron ovinus* Cronq.

Endemic to the Sheep Mountains of Clark Co. and Mt. Irish of the Groom Range in Lincoln Co.; ca. 7000-8000 ft, rock crevices, pinyon-juniper, yellow pine, or fir, June-July.

25. *Erigeron peregrinus* (Banks ex Pursh) E. Greene

A. Peduncles appressed or ascending pubescent; leaves glabrous to short villous. var. *callianthemus*

A. Peduncles spreading hirsute; leaves hirsute on both surfaces. var. *hirsutus*

Erigeron peregrinus (Banks ex Pursh) E. Greene var. *callianthemus* (E. Greene) Cronq. [*E. peregrinus* (Banks ex Pursh) E. Greene var. *angustifolius* (A. Gray) Cronq.; *E. peregrinus* (Banks ex Pursh) E. Greene var. *scaposus* (Torr. & Gray) Cronq.]

Douglas, Elko, Humboldt, Storey, and Washoe cos.; 7000-10000 ft, moist or wet meadows, sometimes dry grassy slopes, open or under pine or fir, July-September. British Columbia and Alberta, south to eastern California, Utah, and north central New Mexico. All Nevada plants of *E. peregrinus* are part of subsp. *callianthemus* (E. Greene) Cronq.

Erigeron peregrinus (Banks ex Pursh) E. Greene var. *hirsutus* Cronq.

Mineral Co. (Aurora); ca. 8500 ft, grassy slopes, July-August. Adjacent east central to south central California.

26. *Erigeron philadelphicus* L.

Washoe Co., where known from a single collection (*Tiehm 10642*, NSMC!); 4500 ft, moist creek bank, June. Native to the eastern U.S.A. but widely scattered in the West; expected in other moist Nevada localities at moderate elevations.

27. *Erigeron pumilus* Nutt. [*E. pumilus* Nutt. var. *gracilior* Cronq.]

Carson City, Douglas, Elko, Esmeralda, Eureka, Humboldt, Lander, Lincoln, Mineral, and Washoe cos.; 4600-7600(-9100) ft, moist or dry soil, meadows or sagebrush, May-August. Southern British Columbia, Washington, Oregon, northeastern California, Idaho, western Montana, northwestern Wyoming, and north central Utah. All Nevada plants are var. *intermedius* Cronq.; the var. *pumilus* occurs east of the continental divide.

28. *Erigeron pygmaeus* (A. Gray) E. Greene

Esmeralda, Lyon, and Washoe cos.; ca. 10000-11900 ft, rocky ridges or slopes, often talus, above timberline or sometimes subalpine, July-August. Sierra Nevada of east central California.

29. *Erigeron speciosus* (Lindl.) DC. [*E. macranthus* Nutt.; *E. speciosus* (Lindl.) DC. var. *macranthus* (Nutt.) Cronq.]

Elko and Humboldt cos.; 6200-7500 ft, dry or moist, gravelly or loamy soil, yellow pine, July-August. Southern British Columbia and Alberta, south to Oregon, Idaho, Montana, western New Mexico, and Arizona; disjunct in northern Baja California.

30. *Erigeron tener* (A. Gray) A. Gray

Douglas, Elko, Esmeralda, Eureka, Humboldt, Lander, Mineral, Nye, Pershing, and White Pine cos.; 5800-10600(-11300) ft, rocky or gravelly habitats, often in talus cliff ledges or crevices, or ridgetops, *Atriplex*, sagebrush, pinyon-juniper, yellow pine, or bristlecone pine, limber pine, or spruce, June-September. Eastern California, southern Oregon and Idaho, southwestern Montana, western Wyoming, and northern Utah.

31. *Erigeron uncialis* S.F. Blake

A. Lower stems with mostly appressed or ascending pubescence, spreading near the heads. var. *conjugans*

A. Upper and lower stems with spreading-hirsute pubescence.
..... var. *uncialis*

Erigeron uncialis S.F. Blake var. *conjugans* S.F. Blake [*E. uncialis* S.F. Blake subsp. *conjugans* (S.F. Blake) Cronq.]

Endemic to Clark, Lincoln, and Nye cos.; 7300-9200 ft, crevices in limestone cliffs and boulders, yellow pine or limber pine, May-August.

Erigeron uncialis S.F. Blake var. *uncialis* [*E. cavernensis* Welsh & Atwood]

Nye and White Pine cos.; 9500-11100 ft, limestone ridges, outcrops, and cliffs, June-July. Eastern Inyo and eastern San Bernardino cos., California.

32. *Erigeron ursinus* D.C. Eat.

White Pine Co.; ca. 8000-9950 ft, sagebrush-grassland, subalpine meadows, July-August. Eastern Idaho, central Montana, Wyoming, Colorado, Utah, and northern Arizona.

33. *Erigeron vagus* Payson

Elko Co.; 10500-13000 ft, usually in alpine talus, June-August. East central California, scattered populations in Oregon, Colorado, and Utah.

34. *Erigeron watsonii* (A. Gray) Cronq.

Elko Co. and the Snake Range of White Pine Co.; 8200-11000 ft, moist or dry, gravelly or rocky soil on slopes, July-September. Western Utah and the Albion Mts. of Cassia Co. in south central Idaho.

ACKNOWLEDGMENTS

The Memphis State address is given first since the greatest part of this study was completed during my employment there. I thank the staffs of RENO and NSMC for loans of specimens; other collections have been studied from various herbaria, particularly CAS and UC. Ann Pinzl (NSMC) has been especially helpful during several stages of this study in bringing recent Nevada collections to my attention and providing much other detailed and critical information. I am also grateful to B.L. Turner for his review of the manuscript; A. Cronquist commented on an early version (1988) and J. Kartesz made several suggestions regarding nomenclature.

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NEW SPECIES OF GESNERIACEAE FROM THE NEOTROPICS

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ABSTRACT

Twenty five new species in nine genera of Gesneriaceae are described. Most of these species are already in cultivation. Illustrations and more detailed descriptions will follow in the first volume of *Gesneriana*.

KEY WORDS: Gesneriaceae, *Achimenes*, *Codonanthe*, *Columnea*, *Dalbergaria*, *Drymonia*, *Paradrymonia*, *Pentadenia*, *Rhoogeton*, *Smithiantha*, México, Honduras, Costa Rica, Panamá, Colombia, Ecuador, Bolivia

Achimenes admirabilis Wiehler, *sp. nov.* TYPE: MEXICO. Oaxaca: District Juchitán, headwaters of Río Coatzacoalcos, E. of Santa María Chimalapa, above junction with Río Blanco, on large boulders by river. Rhizomes collected by T.B. MacDougall, no. 668, April 1966, cultivated at Cornell and GRF greenhouses, accession no. G-1024, 5 Jan. 1984, Wiehler 8404 (HOLOTYPE: GES; Isotypes: BH,K,MEXU,NY,SEL,US, others to be distributed).

A *A. erecta* (Lamarck) H.P. Fuchs caulibus, petiolis pedicellisque trichomatibus glanduliferis, rhizomatibus sine trichomatibus glanduliferis, corollarum tubis longioribus, et corollarum faucibus sine sacculis recedit.

Slender, terrestrial herb with underground rhizomes with compacted, thick, succulent leaf scales, each rhizome ca. 1.5 by 0.3 cm, pale yellow, externally glabrous; stems erect or ascending, rarely branching, 10-25 cm tall, ca. 2.5 mm in diameter, reddish maroon, with elongated green lenticels, puberulous, with scattered longer capitate glandular trichomes, the internodes 0.5-3.0 cm long,

the *leaves* in whorls of 3 or 4, of equal size, the petioles 0.4–1.0 cm long, reddish maroon, puberulous, with scattered longer capitate glandular trichomes, the lamina lanceolate-elliptic, 2.5–3.5 by 1.0–1.5 cm, acuminate, serrate, cuneate, adaxially dark green, hirsute, abaxially lighter green, or spotted with maroon, or completely maroon, or merely the veins outlined with maroon, puberulous, the secondary pairs of veins 3–5. *Inflorescence* an axillary cyme of 1, 2, or more flowers (the second and any subsequent flower often changed into an asexual propagule consisting of a bright green, scaly rhizome), the peduncle present or absent, the prophylls 0.4–1.2 by 0.2–0.5 cm, the pedicels 1.2–2.0 cm, maroon, puberulous-hirsute, with capitate glandular trichomes, the hypanthium at anthesis ca. 2 mm long, the *calyx* lobes equal, triangular, ca. 5 by 2 mm, entire, yellow-green, hirsute, with capitate-glandular trichomes; *corolla* oblique in the calyx, tubular, with a minute spur, the tube ca. 2 cm long, bright orange-red, glabrous but with scattered capitate glandular trichomes, the limb large and oblique to the tube, the lobes spreading, unequal, the 2 upper lobes ca. 5 by 8 mm, the other 3 lobes ca. 7 by 8 mm, bright orange-red, glabrous, the throat yellow, with maroon spotting, the tube inside glabrous, but dorsally near the throat with short, capitate glandular trichomes; *stamens* 4, included, ca. 1.5 cm long, white, glabrous, the anthers coherent into a square, each anther 0.8 by 0.8 mm, the thecae parallel, dehiscing by longitudinal slits; *ovary* semi-inferior, turbinate, ca. 5 mm long, green, sericeous, the style ca. 1.4 cm long, white, pilose, the stigma bilobed; nectary a ring, ca. 1 mm high, yellow, glabrous. *Fruit* a dry, bivalved capsule, splitting loculicidally; *seed* fusiform, 0.4 by 0.2 mm, striate, light brown. Chromosome number $n=11$ (Wiehler 1977).

Codonanthe erubescens Wiehler, *sp. nov.* TYPE: ECUADOR. Morona-Santiago: 10 km S of Gualaquiza, on road from Limón to Zamora, on trees in cow pasture, 22 April 1988, *Wiehler & GRF Expedition 88152* (HOLOTYPE: GES; Isotypes: QCA, F, K, MO, NY, S, SEL, U, US).

Habitu plantae et aspectu floris *C. crassifoliae* (Focke) Morton similis, praecipue differt corollis longioribus, staminum filamentis pilosis, antherarum thecis corniculatis, et ovariorum stylis pilosis.

Epiphytic, perennial herb and creeper, the thin *stems* to 1 m long, 1–2 mm in diameter, young shoots green, older stems tan, clinging to tree trunks or branches, with adventitious roots on nodes and internodes, or pendent stems draping from branches, freely branching, the internodes 0.5 to 3 cm long, stems, leaves, pedicels, and calyx minutely pubescent but appearing glabrous; *leaves* opposite decussate, equal or subequal, the petiole ca. 0.6 cm long, green, the lamina ovate, rarely elliptic, acute, entire, rarely obscurely serrulate, decurrent, succulent, green or flushed with red, with 6–8 dotlike extrafloral nectaries abaxially, the secondary veins invisible. *Inflorescence* a

reduced, axillary cyme of several flowers (but appearing one at a time), the peduncle and prophylls absent, the pedicels 5-8 mm long, green; *calyx* conical, the lobes subequal, lanceolate, 3-5 by 1.0-1.5 mm, entire, green or suffused with red, with an extrafloral nectary in the sinus between adjacent lobes; *corolla* oblique in the calyx, infundibular, 3.0-3.5 cm long, cream-white, in full sun flushed with pink, puberulous, constricted above the long, curved spur, then abruptly expanding, the diameter above midpoint and below the spreading limb 7 mm, the lobes subequal, 5 by 5 mm, rounded, entire, the inside of the tube puberulous; *stamens* 4, included, the filaments 2.1 cm long, adnate to the base of the corolla tube for 9 mm, white, pubescent, pilose, and with capitate glandular trichomes, the anthers syngenesous in pairs, white, 1.0 by 1.6 mm, the thecae dehiscent by a central pore adorned with short, triangular horns; *ovary* superior, turbinate, 4 mm long, green, pubescent, the 1.3 cm long, white, pilose, the stigma stomatomorphic; *nectary* a double connate dorsal gland, white, pubescent. *Fruit* an ovoid, slightly pointed, shiny, red, pubescent berry, 1.2 cm long; *seed* elliptic, 2 mm long, reddish, striate, enveloped by a fleshy funicle 3.2 mm long.

Columnnea filipendula* Wiehler, *sp. nov. TYPE: HONDURAS. foggy cloud forest S of Copán, altitude 1450 m, live cuttings collected in June 1981 by *Claire Herzog s.n.*, cultivated at Selby Gardens and the GRF under accession no. G-3063; type material prepared 6 May 1987, *Wiehler 87103* (HOLOTYPE: GES; Isotypes: EAP,F,K,MO,NY,SEL,US).

Differt a congeneris omnibus longitudine pedicelli pendentis tenuis.

Epiphytic, perennial herb, the *stems* erect, ascending, spreading or descending, to 50 cm long, to 8 mm in diameter, young shoots green, mature stems tan, sericeous, the internodes 2.5 to 5.0 cm long; *leaves* ternate, less frequently opposite decussate, equal or subequal, the petiole 1 cm long, sericeous, the lamina narrowly elliptic, 6.0-9.5 by 1.5-2.0 cm, long acuminate, subentire, cuneate, green, glabrous, sericeous along the veins below, the secondary pairs of veins 4-5. *Inflorescence* reduced to solitary flowers in the leaf axils, the peduncle absent, the bracts and prophylls minute, lanceolate, 1 mm long, the sigmoid, thin pedicel 5-6 cm long, the receptacle 3 mm long, both red-maroon, sericeous; *calyx* lobes subequal, lanceolate, ca. 2 cm long, 0.5 cm wide, subentire, with 1-2 small teeth, yellow-green suffused with maroon, sericeous; *corolla* erect in the calyx, ca. 6.4 cm long, bright orange-red, sericeous, with a pronounced spur, the tube gradually expanding, the galea 2.0 by 1.3 cm, the lateral lobes triangular, 7 mm long, the ventral lobe recurved, elliptic, 1.3 cm long, the inside of the tube pubescent; *stamens* 4, the filaments ca. 5.5 cm long, reddish, puberulous, adnate to the base of the corolla tube for 7 mm,

the anthers exposed in the male phase of anthesis, syngenesous into a square, each anther 2.0 by 1.3 mm; ovary superior, turbinate, 5 mm long, maroon, sericeous, the style ca. 5.8 cm long at the female phase of anthesis, reddish, pilose, the stigma stomatomorphic-bilabiate; *nectary* a double connate, dorsal gland, 2.4 x 2.0 mm, white, glabrous. *Fruit* a globoid, white, sericeous berry, ca. 1.6 cm in diameter; *seed* oblong, 1.4 mm long, striate, reddish.

***Columnnea glicensteinii* Wiehler, sp. nov.** TYPE: COSTA RICA. without specific locality: live plants collected by L. Glicenstein, no. 13, in 1978, GRF greenhouse accession no. W-2674, 4 June 1984, Wiehler 8401 (HOLOTYPE: GES; Isotypes: CR,K,NY,SEL,US, others to be distributed).

C. nicaraguensi Oersted affinis, sed caulibus squammulosis, foliis rubris, calicum lobis serratis, et corollarum tubis pilosis differt.

Epiphytic, perennial herb or subshrub with *stems* erect, ascending or descending, to 40 cm long, 7-10 mm in diameter, tan, sericeous, covered with little brown scales, the internodes 2-3 cm long; *leaf* pairs very unequal, the petiole ca. 3 mm long, yellow-green, sericeous, the lamina of the larger leaf of a pair elliptic or oblanceolate, 11-15 x 4-5 cm, acuminate, entire, oblique, dark green above, lighter green and blotched or suffused with wine-red below, puberulous, the secondary pairs of veins 4-6, the lamina of the smaller leaf similar, 3-5 by 1.5-2.0 cm. *Inflorescence* reduced to solitary flowers in the axils of the larger leaves, the peduncle absent, the bracts and prophylls 5-9 by 2-4 mm, green, the pedicels 1.0-1.4 cm long, yellow-green, sericeous, the receptacle ca. 5 mm long, yellow-green, villous, the *calyx* lobes subequal, lanceolate, ca. 1.6 cm long, serrate, light green, adaxially blotched with wine-red, sericeous; *corolla* ca. 7.5 cm long, the dorsal side and the lobes wine-red, with yellow veins, the ventral side and the spur lemon-yellow, the tube outside glandular pilose (long, capitate, glandular trichomes), inside puberulous with short capitate glandular trichomes; *stamens* 4, the filaments ca. 6 cm long, yellow, distally glandular pilose, the anthers at anthesis exerted, coherent into a rectangle, each anther 2.0 by 1.7 mm; *ovary* superior, ovoid, yellow-green, sericeous, the style ca. 7 cm long, cream-white, distally glandular pilose, the stigma bilobed; *nectary* a double connate, dorsal gland, 2.5 by 1.5 mm, white, glabrous. *Fruit* a globoid, white, pilose berry, ca. 1.5 cm in diameter; *seed* oblong, 1.8 mm long, striate, brown.

***Dalbergaria evolvens* Wiehler, sp. nov.** TYPE: ECUADOR. Napo: km 71 on road from Baeza to Lago Agrio, epiphyte on moss covered tree trunks, and terrestrial in wet gravel on roadside cut, in flower, 4 May

1979, *Wiehler & Masterson 7904* (GES,QCA,NY,S); type material prepared from live cuttings of above collection, GRF greenhouse accession no. G-2757, 8 June 1984, *Wiehler 8403* (HOLOTYPE: GES; Isotypes: QCA,K,MO,NY,S,SEL,US).

Dalbergariae madisoniae Wiehler aemulans, differt nodiis brevioribus, corollarum tubis citrinis, sine callis, extus sericeis, intus trichomatibus glanduliferis.

Epiphytic, perennial, suffrutescent herb, the *stems* erect, ascending or spreading, sparsely branching, to 1.5 m tall, 0.7-1.2 cm in diameter, green, sericeous, the internodes 0.6-2.2 cm long; *leaf* pairs very unequal, the petiole 0.3-1.0 cm long, green, sericeous, the lamina of the larger leaf of a pair oblanceolate, 14-17 by 4.5-6.0 cm, acuminate, obscurely serrulate, oblique, the adaxial surface dark green and glabrescent, the abaxial surface with a red tip, lighter green or flushed with maroon, puberulous, with 7-8 pairs of secondary veins, the lamina of the smaller leaf similar, 2-3 by 0.5-0.8 cm. *Inflorescence* an axillary, reduced cyme of 1-2 flowers, the peduncle absent, the prophylls lanceolate, ca. 3 by 0.8 cm, entire, ciliate, greenish yellow or flushed or spotted with maroon, sericeous, the subtending bracts similar, linear, ca. 1 by 0.3 cm, the pedicels ca. 0.4 cm long, greenish yellow, sericeous, distally with prominent red calluses; *calyx* conical, the lobes subequal, lanceolate, ca. 2.2 by 0.3 cm, thickened and swollen at the base, subentire or obscurely serrulate, ciliate, greenish yellow, sometimes spotted with maroon, sericeous; *corolla* oblique in the calyx, tubular, ca. 5.3 cm long, spurred, sigmoid, lemon-yellow, sericeous, the lobes unequal, the upper 2 fused into a galea, 8 by 6 mm, the lateral lobes triangular, 6 mm long, the lower lobe recurved, ca. 10 by 5 mm, the ventral part of the throat marked with red, the inside of the galea, the lower lobe, and the inside of the tube furnished with capitate glandular trichomes; *stamens* 4, partially excluded in the male phase, the filaments ca. 4 cm long, yellow, glabrous, the anthers coherent into a rectangle, each anther 2 by 2 mm; *ovary* superior, turbinate, ca. 6 mm long, pale yellow, sericeous, the style ca. 4.5 cm long, pale yellow, with capitate glandular trichomes, the stigma bilabiate; *nectary* a double connate, dorsal, white, glabrous gland, 1.5 by 1.5 mm. *Fruit* a narrowly pointed berry, ca. 2.3 by 0.8 cm, yellow, sericeous, surrounded by enlarged calyx lobes, ca. 3.5 by 0.7 cm; *seed* fusiform, ca. 1.2 by 0.3 mm, striate, brown.

Dalbergaria filifera Wiehler, *sp. nov.* TYPE: ECUADOR. Esmeraldas: near new road from Lita and Alto Tambo towards San Lorenzo, about 20 km W of Alto Tambo, on the Chocó Escarpment, the first rise of the Andes from the hot lowland, ca. 1000 m altitude, extremely wet subcloud

forest, terrestrial in open, primary forest, 22 April 1990, *Wiehler & GRF Expedition 9033* (HOLOTYPE: GES; Isotypes: QCA,US).

Ex affinitate *Dalbergariae lanatae* (Seemann) Wiehler et *D. crassae* (Morton) Wiehler, ab utroque calycum forma et corollarum appendicibus distinctus.

Terrestrial (in extremely wet subcloud forest), perennial herb or subshrub, the stems ascending or spreading, to 1 m tall, 0.9-1.2 cm in diameter, maroon, sericeous, the internodes 1.5 to 8.0 cm long; leaf pairs very unequal, the petiole of the larger leaf 1.5 to 2.3 cm long, maroon, sericeous, the lamina of the larger leaf oblanceolate, 23-19 by 6-9 cm, acuminate, serrulate to subentire, oblique, upper leaf surface bluish green, glabrous, lower surface green, green with maroon spotting or flushing, or completely maroon, glabrous but sericeous along the veins, with 2 or 4 translucent red spots below the apex, along the midvein, with additional smaller translucent spots scattered irregularly, the secondary pairs of veins 8-10, the lamina of the smaller leaf similar, 2 by 1 cm, without translucent spots, often caducous. *Inflorescence* reduced to axillary cymes of 1-2 flowers, the peduncle absent, the small prophylls lanceolate, 9 by 2 mm, the pedicels ca. 0.4 cm long; *calyx* conical, greenish yellow, sericeous, the lobes subequal, narrowly lanceolate, pectinate, the filiform teeth 5 to 12 mm long, some of the teeth with secondary branching, greenish yellow, lanate; *corolla* erect in the calyx, tubular, ca. 3.3 cm long (not including the lobe filaments), lemon-yellow, lanate, constricted above the spur, inflated at midpoint, the nonspreading lobes equal, rounded, 5 by 4 mm, with a 1.8-2.3 long, 1 mm in diameter, bright orange, sericeous-hirsute filament extending from the outside of each lobe, the inside of the lobes and the inside of the tube glabrous; *stamens* 4, included, the filaments adnate to the base of the corolla tube for 1 mm, ca. 2.5 cm long, white, glabrous, the anthers syngenesous into a rectangle, each anther 4 by 2 mm; *ovary* turbinate, 4 cm long at anthesis, white, pubescent, the style ca. 2.5 cm long, white, pubescent, the stigma bilabiate; nectary reduced to a double connate, dorsal gland, 2 mm long, reddish, glabrous. *Fruit* not seen.

***Dalbergaria mastersonii* Wiehler, sp. nov.** TYPE: ECUADOR. Pichincha: Cloud forest of Tandapi, near village of Cornejo Astorga (Tandapi), about 1.5 km from bridge over Río Pilatón, epiphyte in sunny area, 24 April 1979, *Wiehler & Masterson 7968* (HOLOTYPE: GES; Isotypes: QCA,NY,US,U,SEL, others to be distributed).

Ex affinitate *Dalbergariae asterolomae* Wiehler, a qua imprimis differt habitu compacto, foliorum laminis adaxialibus hirsutis, calicum lobis acutis serratisque, corollis brevioribus, et antherarum filamentis ovariorumque stylis glabris.

Epiphytic, perennial subshrub, the *stems* emerging from a common base, erect, ascending or spreading, sparsely or nonbranching, to 1 m tall, 0.8-1.9 cm in diameter, tan and woolly below, green and velutinous near the apex, the internodes 2-5 cm long; *leaf* pairs very unequal, the petiole subsessile, to 5 mm long, the lamina of the larger leaf of a pair oblanceolate, 20-31 by 5-11 cm, acute, serrulate, oblique, the adaxial surface dark green, hirsute, the abaxial surface sericeous, pale green, the apex for 3-7 cm solid dark red (Greyed Purple Group 183 A), often also with additional deep red blotches below the apex, and/or deep red margins and midveins, with 13-15 pairs of secondary veins; the lamina of the smaller leaf of a pair similar, but lanceolate, 3-6 by 0.7-1.4 cm. *Inflorescence* in the axil of the larger leaf of a pair, a reduced cyme of 2-4 flowers, the peduncle absent, the prominent prophylls ovate, serrate, ca. 4.0 by 2.5 cm, usually wine-red (Greyed Purple Group 183 D, but in other collections pale yellow-green), glabrescent above, hirsute below, the subtending bracts lanceolate, ca. 3.0 by 1.5 cm, yellow-green, blotched with wine-red, indumentum as above; pedicels ca. 0.4 cm long, yellow-green, blotched with wine-red, sericeous; *calyx* conical, the lobes subequal, lanceolate, ca. 2 cm long, serrate, yellow-green and blotched with wine-red or completely wine-red, with long, silky, white hairs; *corolla* slightly oblique in the calyx, tubular, ca. 4 cm long, spurred, inflated near midpoint, proximally white and glabrous, the upper 2/3 yellow-green (Yellow Green Group 154 B), covered with appressed, long, silky, white hairs, the lobes subequal, ovoid, each ca. 4 by 4 mm, entire, glabrous inside, but with capitate glandular trichomes at the base of each lobe, the tube inside glabrous; *stamens* 4, included in the male phase, the filaments ca. 3 cm long, white, glabrous, the anthers coherent into a rectangle, each anther ca. 2 by 2 mm; *ovary* superior, turbinate, ca. 6 cm long, yellow-green, sericeous, the style ca. 3 cm long, white, glabrous, the stigma bilabiate; *nectary* a double connate, dorsal, greyish white, glabrous gland, 2.1 by 2.1 mm. *Fruit* a pointed berry, ca. 1.7 by 1.1 cm, pink (Red Group 38 A), sericeous; *seed* fusiform, ca. 1.2 by 0.3 mm, striate, brown.

***Dalbergaria medicinalis* Wiehler, sp. nov.** TYPE: ECUADOR. Pichincha: above Chiriboga, on old road from Quito to Santo Domingo, 2100 m altitude, on tree in cow pasture by creek, open, sunny area, prophylls plain green or maroon, corolla cream-white, lobes orange, 26 April 1988, *Wiehler & GRF Expedition 88215* (HOLOTYPE: GES; Isotypes: QCA, K, MO, NY, SEL, US).

Differt a *Dalbergaria picta* (Karsten) Wiehler foliorum apicibus non translucidis, corollarum forma recta et baccis albis.

Epiphytic, perennial, suffrutescent herb, the *stems* erect, ascending, or spreading, sparsely branching, to 1.2 m long, ca. 1.2 cm in diameter, tan below, green near apex, densely sericeous, the internodes 2.0-4.5 cm long; *leaf*

pairs very unequal, the petiole ca. 5 mm long, green, sericeous, the lamina of the larger leaf of a pair elliptic, acuminate, subentire to obscurely serrulate, ciliate, oblique, green and sericeous on both surfaces, but the abaxial side with maroon-red tips, additional spotting, or completely maroon-red, with ca. 12 pairs of secondary veins, the lamina of the smaller leaf of a pair similar, ca. 3 by 1 cm. *Inflorescence* an axillary, reduced cyme of 1-4 flowers, the common peduncle absent, the prophylls leafy, ovate, ca. 5.0 by 4.5 cm, subentire, sericeous, yellow-green, often spotted with maroon-red, or completely maroon-red, the margins sometimes edged with yellow, the subtending bracts lanceolate, 3.5 by 0.7 cm, similar to the prophylls, the pedicels ca. 1 cm long, yellow-green, sericeous, distally covered with red calluses; *calyx* conical, similar to pedicel, covered with red calluses, the lobes subequal, lanceolate, ca. 1 by 0.4 cm (2.5 by 1 cm in fruit), with a raised midvein, subentire, yellow-green, sericeous; *corolla* erect in the calyx, columnneoid, 5.0-6.6 cm long, constricted below the spur, the tube white, cream-white or yellow, sericeous, the face of the limb orange (in other collections similar to tube, marked with maroon-red or rose), the galea 0.9 by 1.8 cm, the lateral lobes triangular, 1 cm long, the lower lobe lanceolate, 1.6 by 0.7 cm, the throat covered with glandular capitate trichomes, the inside of the tube glabrous; *stamens* 4, excluded in the male phase of anthesis, adnate to the base of the corolla tube, 4.5-5.5 cm long, white, pubescent, the anthers syngenesous into a rectangle, each anther 3 by 3 mm; *ovary* superior, turbinate, 5-7 mm long, sericeous, the style 4.5-5.5 cm long, distally pubescent, with glandular capitate trichomes, the stigma stomatomorphic; *nectary* a double connate, dorsal, glabrous gland, 3 by 5 mm. *Fruit* a pointed berry, 2.5 cm long, 1.4 cm wide, cream-white, sericeous; *seed* fusiform, 1 by 0.3 mm, striate, brown, with a funicle 4 mm long.

***Dalbergaria ornata* Wiehler, sp. nov.** TYPE: COSTA RICA. San José: ca. 30 km SW of the city of San José, along Río Negro. Live plant material collected by John Hall s.n. in Jan. 1979, grown in GRF greenhouse under accession no. G-2665, type specimens prepared 8 May 1987, *Wiehler 87105* (HOLOTYPE: GES; Isotypes: CR, SEL, others to be distributed).

Habitu et corollae forma *Dalbergariae polyanthae* Wiehler similis, praesertim differt foliis maculatis, calycum lobis integribus, corollis aurantiacis baccisque albis.

Epiphytic, perennial, suffrutescent herb, the stems erect, ascending or spreading, branching, to 2 m long, 0.8-1.6 cm in diameter, green or tan, lanate, the internodes 1.5-6.0 cm long; leaf pairs very unequal, the petiole subsessile to 1 cm long, green, velutinous, the lamina of the larger leaf of a pair oblanceolate, 18-31 by 5-10 cm, acuminate, serrate, ciliate, oblique, adaxially bluish green,

hirsute, abaxially green, more frequently green with irregular red-maroon spotting, sometimes completely red-maroon, hirsute (trichomes maroon), with 8-10 pairs of secondary veins, the lamina of the smaller leaf of a pair similar, 3 by 1 cm, early caducous. *Inflorescence* an axillary, reduced cyme of 4-10 flowers, the peduncle absent, the prophylls ovate, 1 by 0.8 cm, the subtending bracts lanceolate, 1 by 0.3 cm, both red-maroon, velutinous, the pedicels ca. 2 cm long, yellow-green, velutinous, the long trichomes maroon; *calyx* conical, the lobes subequal, narrowly lanceolate, entire, ciliate, maroon with yellow-green borders, velutinous; *corolla* erect in the calyx, tubular, ca. 5 cm long, orange, pilose, spurred, the spreading lobes subequal, 5 by 5 mm, yellow, with red centers, the tube inside pubescent; *stamens* 4, excluded in the male phase of anthesis, the filaments 5.3 cm long, adnate to the base of the corolla tube for 1 mm, white, pubescent, the anthers syngenesous into a rectangle, each anther 1.8 by 1.2 mm; *ovary* superior, turbinate, 6 mm long, maroon, sericeous, the style ca. 4.8 cm long at the female stage of anthesis, white, glabrous, the stigma stomatomorphic; *nectary* a double connate, dorsal gland, 2 by 4 mm, and a single ventral gland, 2.0 by 1.2 mm, both glabrous. *Fruit* an elongated, ovoid, white, sericeous berry, 1.9 by 1.2 cm; *seed* oblong, 1.2 mm long, striate, reddish, with a fleshy funicle 2.6 mm long.

Dalbergaria tutunendana Wiehler, *sp. nov.* TYPE: COLOMBIA. Chocó: E of Tutunendo, on road Quibdo to Bolivar, Alto de Veinte, hacienda of Ruben Jaramillo, very moist rain forest on slope to river, ca. 480 m altitude, 15 March 1987, *Wiehler & GRF Expedition 8722* (HOLOTYPE: HUA; Isotypes: COL, GES, US).

Species nova *Dalbergariae schimpffii* (Mansfeld) Wiehler proxima. Differt foliis majoribus, coriaceis, glabrescentibus, apicibus viridibus, et floribus luteis.

Epiphytic, perennial herb or subshrub, the shoots emerging from a common base, sparsely branching, to 45 cm tall, 0.7-1.3 cm in diameter, grayish tan below, greenish tan towards the apex, sericeous, the internodes 2.0-3.5 cm long; *leaf* pairs very unequal, the petiole of the larger leaf of a pair ca. 2 cm long, ca. 6 mm in diameter, green, sericeous, the lamina oblanceolate, 22-27 by 8-11 cm, acute, entire to obscurely serrulate, ciliate, oblique, leathery, the adaxial surface dark green, glabrescent to glabrous, the abaxial surface lighter green, occasionally with 2 red spots below the apex, glabrescent, the veins sericeous, with 13 pairs of secondary veins, the petiole of the smaller leaf of a pair 1-2 cm long, the lamina lanceolate, ca. 2.5 by 0.5 cm. *Inflorescences* in the axils of the larger leaf of a pair, a reduced cyme of 2 to 4 flowers, the peduncle absent, the prophylls and subtending bracts small and nonshowy, lanceolate, 7-10 by 1.0-2.5 cm, yellow-green, with red hairs, the pedicels ca. 7 mm long,

yellow-green, covered with red hairs; *calyx* lobes equal sized, lanceolate, ca. 2.3 cm long, fused for ca. 4 mm, fimbriate, with ca. 10 teeth on each side of the lobe, yellow-green but appearing orange-red (Orange-Red Group 34A) because of the prominent velutinous indumentum, in fruit changing to wine-red (Red Group 46A), the long teeth covered with the same silky red hairs; *corolla* almost erect in the calyx, tubular, ca. 3.6 cm long, prominently spurred, inflated in the middle, the spur cream-white, the tube salmon-red (Red Group 40C), distally covered with long, velutinous, lemon-yellow indumentum, the small, spreading lobes subequal, rounded, each lobe ca. 2.5 by 2.5 mm, deep red (Red Group 45A), glabrous, the tube glabrous within; *stamens* 4, included in the male phase of anthesis, the filaments ca. 3.2 cm long, cream-white, glabrous, the anthers coherent into a rectangle, each anther 2 by 2 mm; *ovary* superior, turbinate, ca. 7 mm long, salmon red, with a few cream-white spots near the base, sericeous, the style ca. 2.5 cm long, white, glabrous, the stigma bilabiate, included in the female phase of anthesis; *nectary* a double connate, dorsal, glabrous, white gland, 2.5 by 2.0 mm. *Fruit* a pointed berry, ca. 2.4 by 1.0 cm, salmon red, blotched with cream-white near the base, sericeous; *seed* fusiform, ca. 1.2 by 0.3 mm, striate, brown.

Drymonia chiribogana Wiehler, *sp. nov.* TYPE: ECUADOR. Pichincha: old road from Quito to Santo Domingo, near Chiriboga, 1200 m altitude, epiphyte in forest, 26 April 1988, *Wiehler & GRF Expedition 88222* (HOLOTYPE: GES; Isotypes: QCA,K,NY,US).

Habitu plantae, foliis albo-nervatis, et calycibus foliosis *Drymoniae killipii* Wiehler similis, sed foliis glabrescentibus, corollarum forma coloreque, et stylis glabris.

Epiphytic, perennial subshrub, the *stems* sparsely branching, erect, ascending or spreading, to 1.4 m long, to 2.2 cm in diameter, green, glabrescent, the internodes 2-5 cm long; *leaf* pairs subequal to unequal, the petioles 4-5 cm long, green, glabrescent, adaxially with 2 parallel maroon stripes, the lamina oblanceolate-elliptic, 17-14 by 8-10 cm, acuminate, subentire, oblique, leathery, green, glabrescent, the midvein, secondary, and tertiary veins marked whitish or silvery adaxially, the secondary pairs of veins 6-7. *Inflorescence* reduced to axillary, epeduncular cymes of 2-4 or more flowers, the bracts small (prophylls lanceolate, 1.1 by 0.15 cm), the pedicels 2.2 to 3.0 cm long, light green or maroon, glabrescent; *calyx* conical, the lobes leafy, subequal, ovate, ca. 3.5 by 2.5 cm, acute, subentire, light green, often suffused with maroon or red, glabrescent; *corolla* oblique in the calyx, tubular-infundibular, ca. 4.3 cm long, constricted below the spur, white, the limb magenta, the lobes subequal, rounded, 1.3 by 1.3 cm, erose, the throat and the tube inside furnished with red lines, the nectar guide yellow, the tube outside and inside glabrous except

for trichomes dorsally in the throat; *stamens* 4, included, the filaments ca. 2.6 cm long, attached to the base of the corolla tube for 7 mm, white, glabrous, the anthers syngenesous, oblong, saggitate, each anther ca. 7 by 2 mm; *ovary* superior, obliquely cone shaped, 8 mm long, white, glabrous, the style ca. 2.4 cm long, white, glabrous, the stigma stomatomorphic; *nectary* a double connate, dorsal gland, 2 by 4 mm, grey, glabrous. *Fruit* a bivalved, laterally compressed, fleshy capsule, 2.6 by 2.3 cm, the split carpel walls externally greenish yellow, inside lemon yellow, the exposed cone of placentae, funiculi and seeds glistening grey; *seed* ovoid, 0.9 by 0.6 mm, dark brown.

Drymonia punctulata Wiehler, *sp. nov.* TYPE: ECUADOR. El Oro: road Buena Vista to Paccha, at km 32, 1100 m altitude, 16 April 1989, Williams, Dressler, & Whitten s.n. (GES); seed from this collection sown at GRF greenhouse, accession no. G-3548, type material prepared 31 Aug. 1992, Wiehler 9206 (HOLOTYPE: GES; Isotypes: QCA,MO,NY,SEL,US).

A *Drymonia chiribogana* Wiehler calycum lobis lanceolatis parvioribus, corollarum forma, et limbis integribus albis recedit.

Epiphytic, perennial subshrub, the *stems* sparsely branching, erect, ascending or spreading, to 1.2 m tall, to 2.6 cm in diameter, green turning to tan, glabrous, the internodes 2-9 cm long; *leaf* pairs equal to subequal, the petioles 6-11 cm long, green, glabrous, adaxially with 2 parallel maroon stripes, the lamina ovate to elliptic, 14-21 by 8-12 cm, acuminate, entire, oblique, leathery, shiny, green, (abaxially flushed with maroon in strong sunlight), glabrous, the veins adaxially touched with a grayish white, the secondary pairs of veins 5-6. *Inflorescence* reduced to axillary cymes of 2-4 or more flowers, the peduncle congested, ca. 5 mm long, the prophylls and subtending bracts reduced, subulate, 5-11 mm long, green glabrous, the pedicels ca. 2.3 cm long, green, distally with a maroon flush, glabrous; *calyx* conical, the lobes subequal, lanceolate, ca. 2.5 by 1.1 cm, yellow-green, in strong sunlight flushed with maroon, glabrous, the upper or dorsal lobes with a maroon flush at the base; *corolla* oblique in the calyx, tubular-infundibular, sigmoid, ca. 4 cm long, white, glabrous, slightly constricted above the small spur, the limb white, the lobes subequal, rounded, each lobe ca. 8 by 8 mm, entire, the yellow throat and the white tube inside speckled with small maroon dots (in strong sunlight also the face of the limb); *stamens* 4, included, the filaments ca. 2.2 cm long, white, glabrous, attached to the base of the corolla tube for 6 mm, the anthers syngenesous, oblong, saggitate, each anther ca. 4.0 by 1.6 mm; *ovary* superior, obliquely cone shaped, 6 mm long, white, glabrous, the style ca. 1.5 cm long, white, glabrous, the stigma stomatomorphic; *nectary* a double connate, dorsal gland, 1.4 by 4.0 mm, maroon, glabrous. *Fruit* not seen.

Drymonia uninerva Wiehler, *sp. nov.* TYPE: COSTA RICA. without specific locality: collected by Dr. E.J. Alexander, s.n., in 1960, NY greenhouse accession no. 1670/60, Cornell and GRF accession no. G-796, 28 April 1973, *Wiehler 7327* (HOLOTYPE: GES; Isotypes: B,CR,F,G,GH,K,L,M,MO,NY,P,SEL,U,UC,US,W).

Differt a *D. stenophylla* (Donn. Smith) H.E. Moore petiolis brevioribus, foliis abaxialiter sine nervis secundariis prominentibus, calycum lobis latioribus, corollarum limbis albis, et stigmatibus albis.

Epiphytic, perennial, succulent herb; *stems* sparsely branching, erect or ascending, to 50 cm tall, to 1.5 cm in diameter, grey, glabrous, the internodes 3-5 cm long; *leaf* pairs equal, subequal, or unequal, the petiole 1-2 cm long, green, glabrous, adaxially with 2 parallel maroon stripes, the lamina elliptic, 12-17 by 4-5 cm, acuminate, entire, obtuse, leathery, dark green above, lighter green below, glabrous, the secondary pairs of veins 5-6, somewhat obscure in dried material. *Inflorescence* reduced to axillary, pedunculate cymes of 1-4 flowers, the bracts rudimentary, the pedicels ca. 5 mm long, light green, glabrescent; *calyx* lobes unequal, lanceolate, acuminate, entire, ciliate, light green, glabrescent, the lateral and ventral lobes 2 by 0.7 cm, the dorsal lobe 1.6 by 0.5 cm, the base inside surrounding the ovary and nectary wine-red; *corolla* ca. 4 cm long, cream-white, glabrous, the lobes unequal, arose, the laterals and dorsals ca. 7 by 7 mm, the ventral lobe 1 by 1 cm, the tube inside lemon-yellow, near the base wine-red, glabrous; *stamens* 4, included, the filaments ca. 1.6 cm long, white, suffused with wine-red, glabrous, the anthers coherent, oblong, saggitate, each anther 5 by 2 mm; *ovary* superior, obliquely cone shaped, 3 mm long, yellow, glabrescent, the style ca. 1.9 cm long, white, glabrous, the stigma stomatomorphic; *nectary* a double connate, dorsal gland, 3 by 2 mm, grey, glabrous. *Fruit* a bivalved capsule, fruiting calyx and external ovary wall pale yellow to white, ovary valves inside flushed with pink, the exposed cone of placentae, funiculi and seed mass yellow; dry *seed* ovoid, 1 by 0.5 mm, yellow, with a light brown hue. Chromosome no. $n = 9$ (Wiehler 1972).

Paradrymonia binata Wiehler, *sp. nov.* TYPE: ECUADOR. Esmeraldas: ca. 5 km W of Lita, dense, wet forest near Río Chuchubí, down the slope towards Río Mira, 800 m altitude, epiphyte 1.5 m high on small tree, entangled with dripping wet moss, rosette shaped, the stem near ground level disintegrated, mature leaves (with petioles) over 2 feet (67+ cm) long, 24 April 1990, *Wiehler & GRF Expedition 9071* (GES); type specimens prepared from live material of this collection grown in the

GRF greenhouse, accession no. G-3384, 20 Aug. 1992, *Wiehler 9205* (HOLOTYPE: GES; Isotypes: QCA,NY,US, others to be distributed).

Paradrymoniae hypocyrtae Wiehler primo aspectu maxime simili, sed calycibus laciniatis marroninis et corollis luteis.

Terrestrial and rosette forming herb, or hemi-epiphytic, or epiphytic vine, *stems* in rosette congested, 2-5 cm tall, ca. 1.7 cm in diameter, green, flushed with rose, glabrescent, the internodes ca. 0.7 cm, (stems of vines only seen in the wild, with longer internodes; *leaf* pairs subequal to extremely unequal, the petiole of the larger leaf of a pair 13-31 cm long, ca. 0.9 cm in diameter, adaxially winged, bright red, glabrescent, the lamina lanceolate, ca. 30-36 by 12-19 cm, acute, serrate, the base decurrent, bluish green above, lighter green, flushed with maroon below, glabrescent, sparsely puberulous along the veins, the lateral pairs of veins 14-17, the smaller leaf of a pair often rudimentary, needle shaped, to 2.5 cm long, without lamina, early caducous. *Inflorescence* axillary cymes of 4-10 or more flowers, the peduncle ca. 3 cm long, maroon, sericeous, the prophylls and subtending bracts needle shaped, to 1.3 cm long, maroon, sericeous, the pedicels ca. 2 cm long, maroon, sericeous; *calyx* lobes subequal, lanceolate, ca. 2 cm long, 0.5 cm wide, with ciliate teeth, each tooth ca. 4-10 mm long, maroon, pubescent-pilose; *corolla* oblique in the calyx, hypocyrtoid, with a prominent pouch, ca. 2.5 cm long, bright yellow, glabrous near the base, then pilose, ventrally saccate, the limb constricted to a narrow opening with equal, rounded lobes, each 3 by 3 mm; *stamens* 4, included, the filaments adnate to the base of the corolla tube, ca. 2 cm long, white, glabrous, the anthers syngenesous into a square, each anther 2 by 2 mm; *ovary* superior, turbinate, 3 mm long, maroon, sericeous, the style ca. 2.2 cm long, white, with capitate glandular trichomes, the stigma stomatomorphic bilobed; *nectary* a double connate, dorsal gland, 2 mm long. *Fruit* not seen.

***Paradrymonia fuquaiana* Wiehler, sp. nov.** TYPE: ECUADOR. Napo: N of Tena, road Hollin - Loreto: old road construction camp, at km 17 from Hollin, 1400 m altitude, on logs at roadcut, 6 Jan. 1990, *Determann et al. s.n.*, live plants brought to and grown at Atlanta Botanical Garden, cultivated at GRF greenhouse with accession no. G-3590, type material prepared 20 August 1992, *Wiehler 9204* (HOLOTYPE: GES; Isotypes: QCA,NY,US, others to be distributed).

Quoad florum formam, amplitudinem et fabricam internam ad *Paradrymoniam tylocalycem* Wiehler accedit, sed ab ea differt caulibus nodisque longioribus et foliis rigidis coriaceis.

Terrestrial, rosette forming herb, *stems* erect, somewhat succulent, 3-6 cm tall, ca. 1.7 cm in diameter, green, with a flush of maroon, glabrescent, the internodes 0.5 to 2 cm; *leaf* pairs subequal to strongly unequal, the petiole of the larger leaf of a pair ca. 4-8 cm long, ca. 0.9 cm in diameter, adaxially winged, succulent, green, with a flush of maroon, glabrescent, the lamina of the larger leaf elliptic, 27-35 by 7-10 cm, or larger, acute, serrulate, strongly decurrent at the base, dark green above, lighter green below, glabrescent, the lateral pairs of veins 12-14, the smaller leaf of a pair often rudimentary, needle shaped, without lamina, early caducous. *Inflorescence* axillary cymes of 4-10 flowers, the peduncle ca. 1-2 cm long, maroon, bracts small, linear, 1.8 by 0.15 cm, the pedicels ca. 0.6 cm long, maroon, weakly sericeous; *calyx* conical, maroon, with small green calluses, the lobes subequal, lanceolate, ca. 2.3 by 0.3 cm, entire but occasionally with 1-2 small teeth, maroon, sericeous; *corolla* oblique in the calyx, infundibular, ca. 6 cm long, with a spur 7 mm long, a long, narrow tube, 2.4 cm long, 0.4 cm in diameter, gradually widening, cream-white, hirsute, the limb inside white, dotted with royal purple, glabrous, the subequal, spreading lobes each ca. 1.2 by 1 cm, (lower lobe 1.4 by 1.3 cm), entire, the throat inside yellow-gold, hirsute, the venter of the tube with 2 longitudinal ridges (not grooves); *stamens* 4, included, the filaments ca. 3.5 cm long, adnate to the base of the corolla tube for 5 mm, white, glabrous, the anthers syngenesous into a square, each anther 1.2 by 1.2 mm, the thecae neither horned nor bearded, dehiscing by longitudinal slits; *ovary* turbinate, 5 mm long at anthesis, maroon, sericeous, the style ca. 2.8 cm long, white, pilose, interspersed with capitate glandular trichomes, the stigma stomatomorphic; *nectary* a double connate, dorsal gland, 2 by 2 mm, maroon, glabrous. *Fruit* not seen.

Paradrymonia prististoma* Wiehler, *sp. nov. TYPE: ECUADOR. Napo: unfinished road from Tena to Latacunga, along Río Pano, 16-18 km from Tena, terrestrial and epiphytic, 23 April 1986, *Wiehler & GRF Expedition 86184* (HOLOTYPE: GES; Isotypes: QCA, others to be distributed).

Species habitu cum *P. ciliosa* (Martius) Wiehler optime congruens, sed differt corollae forma et corollae limbo ciliato non nisi in lobo ventrali.

Terrestrial, rosette forming herb and epiphytic climber, *stems* (after juvenile rosette stage) erect or creeping, somewhat succulent, the erect shoots 10 to 20 cm long (or longer), ca. 6-9 mm in diameter, green, sericeous, the internodes 1-3 cm long, with adventitious roots at nodes and internodes; *leaf* pairs subequal to strongly unequal, the petiole of the larger leaf of a pair ca. 4-7 cm long, ca. 8 mm in diameter, adaxially winged, succulent, green, sericeous, the lamina

of the larger leaf lanceolate or elliptic, 18-24 by 5-7 cm, acuminate, strongly decurrent at the base, the margins serrulate, dark green, sericeous (but appearing glabrescent) above, paler green or flushed with red, glabrous (but sericeous along the green veins) below, the lateral pairs of veins 11-13. *Inflorescence* axillary cymes of 4-10 flowers, epedunculate, bracts small, lanceolate-linear, ca. 15 by 2 mm, the pedicels ca. 0.5-1.0 cm long, green, sericeous; *calyx* conical, the lobes subequal, long lanceolate, ca. 20 by 2 mm, each lobe with a few obscure teeth, yellow-green, sericeous; *corolla* oblique in the calyx, infundibular, ca. 4.5-5.0 cm long, canary-yellow, (Yellow Group 13 B), glabrescent, the spur 5 mm long, the tube proximally narrow, ca. 4 mm in diameter, then bending downward and expanding to a diameter of 10 mm, dorsally and ventrally with 2 longitudinal furrows, the limb deeper yellow (Yellow-Orange Group 14 B), the 2 dorsal and 2 lateral lobes subequal, ca. 5 by 8 mm, entire, the lower lobe 8 by 10 mm, with prominent teeth curved upward, each tooth ca. 2.5 mm long, the inside of the tube deep yellow, glabrous; *stamens* 4, included, the filaments ca. 3 cm long, fused and adnate to the base of the corolla tube for 2.5 cm, cream-white, glabrous, the anthers syngenesous into a square, each anther 2 by 2 mm, the anther cells bearded; *ovary* turbinate, ca. 4.5 mm long at anthesis, red, covered with long red trichomes, the style ca. 3 cm long, white, pilose (trichomes red), stigma stomatomorphic-bilobed; *nectary* a large, double connate dorsal gland, 3.3 by 2.3 mm, white, glabrous. *Fruit* not seen.

***Pentadenia hypocyrtantha* Wiehler, sp. nov.** TYPE: BOLIVIA. Santa Cruz: Road Cochabamba to Santa Cruz, between Siberia and Comarapa, near Fortaleza, cloud forest, 2500 m altitude, 15 Jan. 1965, S. Vogel 498 (HOLOTYPE: US; Isotypes: A,F,Z).

Differt a congeneris omnibus forma corollae saccata, *P. trolio* (Mansfeld) Wiehler excepto, quae folii elliptici papyraceique, calicibus lobi denticulati, et corollae dense pilosae habet.

Epiphytic, perennial suffrutescent herb or vine, *stems* ascending, spreading or descending, sparsely branching, 0.7-1.3 cm in diameter, green, tawny or maroon, pubescent to glabrescent, with internodes 1-4 cm long; *leaf* pairs unequal, the petiole 0.9-1.5 cm long, maroon, pubescent, the lamina of the larger leaf of a pair 6.0-8.5 by 3.5-5.5 cm, acute, entire, oblique or rounded, fleshy, green suffused with red, sparsely pubescent above, glabrescent below, with 5 pairs of reddish secondary veins, the lamina of the smaller leaf of a pair similar, ca. 5 by 3 cm. *Inflorescence* a reduced axillary cyme of 1-2 flowers, the pendent pedicels 2-7 cm long, maroon, glabrescent; *calyx* conical, maroon, sparsely pilose to pubescent, the lobes subequal, lanceolate, yellow-green flushed with maroon, the tips bright red, glabrescent, each lobe ca. 1 by 0.3 cm; *corolla* tubular, but with a prominent pouch as in the (now defunct)

genus *Hypocyrtia*, ca. 4 cm long, 2 cm wide, rose-red, glabrescent, the green throat constricted to a diameter of 0.5 cm, the small green lobes subequal, 1.4 by 1.5 mm, the tube inside glabrous; *stamens* 4, included, the white, pubescent filaments ca. 3 cm long, adnate to the base of the corolla tube for 6 mm, the anthers syngenesous, 1.2 by 1.2 mm; *ovary* superior, 5 mm long at anthesis, pubescent, the style ca. 3 cm long; nectary consisting of 5 maroon glands, the two posterior ones partially fused. *Fruit* not seen.

***Pentadenia katzensteinii* Wiehler, sp. nov.** TYPE: ECUADOR. Morona-Santiago: Cordillera del Boliche, about 60 km from Limón south to Gualaquiza, cloud forest, 1650 m altitude, 5 m up on trees within forest, 21 April 1988, *Wiehler & GRF Expedition 88128* (HOLOTYPE: GES; Isotypes: QCA, F, K, MO, NY, US).

Differt a *P. byrsina* Wiehler caulibus rectis, corollis purpureis, antheris inclusis et baccis lavendulaceis.

Epiphytic, perennial, suffrutescent herb with stiff, ascending, spreading and branching *stems*, to ca. 2 m long, 0.5-1.3 cm in diameter, brownish tan, apically maroon, sericeous, with internodes 1.0-3.8 cm long; *leaf* pairs very unequal, the petiole 2-4 mm long, tan, densely sericeous, the lamina of the larger leaf of a pair lanceolate, 5-7 by 1.5-3.0 cm, acuminate, entire, ciliate, strongly oblique, darker green above, lighter green below, glabrescent, sericeous along the maroon veins, with 4-6 pairs of secondary veins; the lamina of the smaller leaf of a pair similar, proximally caducous, distally ca. 1-2 by 0.5-1.0 cm. *Inflorescence* a reduced axillary cyme of 1-4 flowers, in the axils of the larger leaf of a pair, the peduncle absent, the prophylls subulate, 0.7-1.0 cm long, the pedicels 4-6 mm long, light green with a pink flush, sericeous; *calyx* conical, light green with a pink flush, sericeous, the lobes spreading, subequal, narrowly lanceolate to linear, 1.5 by 0.15 cm; *corolla* oblique in the calyx, tubular, slightly sigmoid, ca. 3 cm long, constricted above the cream colored, glabrous spur, the tube inflated above midpoint, lavender-purple, sericeous, the subequal lobes spreading, ca. 2 by 3 mm, deeper purple, edged with yellow, the tube inside glabrous; *stamens* 4, included, the white, pubescent filaments ca. 2 cm long, adnate to the base of the corolla tube for 4 mm, the anthers syngenesous, 1 by 1 mm; *ovary* superior, 3 mm long at anthesis, sericeous, the style ca. 2.5 cm long, white, glabrous, the stigma stomatomorphic; *nectary* consisting of 5 glands, with the 2 dorsal ones and the 3 ventral ones connate, the latter much larger. *Fruit* a globose pale lavender blue berry, ca. 1 cm in diameter; *seed* fusiform, striate, tan, 1.1 mm long, with a fleshy funicle 2.5 mm long.

Pentadenia manabiana Wiehler, *sp. nov.* TYPE: ECUADOR. Manabí: at km 67 on road from Chone to Santo Domingo, 500 m altitude. Epiphyte on old cacao tree. Live material collected by *C.H. Dodson*, 6791 on 31 July 1977, grown at the greenhouses of Selby Gardens and GRF under accession no. 2462. Type material from cultivated plants: 8 July 1987, *Wiehler 87102* (HOLOTYPE: GES; Isotypes: QCA,B,F,HBG,K,MO, NY,SEL,U,US, others to be distributed).

Ex affinitate *P. zapotalanae* Wiehler, a qua imprimis differt foliis sine apicibus rubris corolisque brevioribus non flexis, limbis majoribus patentibus.

Epiphytic, perennial herb or vine with erect, ascending, spreading or descending, branching *stems*, from 60 cm to 1 m long, ca. 0.8 cm in diameter, green or tawny, glabrescent, with internodes 2-4 cm long; *leaf* pairs very unequal, the petiole 0.7-1.9 cm long, green, glabrescent, the lamina of the larger leaf of a pair elliptic, 9-15 by 3-5 cm, acuminate, weakly serrulate, ciliate, strongly oblique, green and glabrescent on both surfaces, the abaxial surface sometimes flushed with red, or completely reddish, with 6-7 pairs of secondary veins; the lamina of the smaller leaf of a pair similar, ca. 4.5 by 2.0 cm. *Inflorescence* a reduced axillary cyme of 1-4 flowers (always in the axil of the larger leaf of a pair), the prophylls, pedicels and calyces light green, glabrescent to sparsely sericeous, ciliate, with the broadly lanceolate prophylls ca. 1.8 by 0.7 cm, the subtending bracts minute, lanceolate, 0.9 by 0.2 cm, the pedicel 0.5-0.7 cm long; *calyx* conical, the lobes unequal, lanceolate, entire, ciliate, sparsely pilose, 4 of the lobes almost equal, 1.5 by 0.2 cm, one of the two lower lobes larger, 1.8 by 0.5 cm; *corolla* erect in the calyx, tubular, light yellow, sparsely pilose, 2.2 cm long, constricted above the spur, the lobes 2 by 3 mm, the limb spreading, ca. 1 cm in diameter, the tube inside glabrous; *stamens* 4, included, the white, pubescent filaments 1.8 cm long, adnate to the base of the corolla for 5 mm, the anthers syngenesous, 1 by 1 mm; *ovary* superior, 2 mm long at anthesis, pubescent, the glabrous style 1.7 cm long, white, the stigma bifid; *nectary* consisting of 5 grey-white, separate glands. *Fruit* a globose, white, pilose berry, 1.2 cm in diameter; *seed* fusiform, striate, yellow, 1.1 mm long, with a fleshy funiculus 1.9 mm long.

Pentadenia rileyi Wiehler, *sp. nov.* TYPE: ECUADOR. Napo: 37 km from Baeza on road to Lago Agrio, epiphyte on trees in open meadow, 1500 m altitude, 24 April 1986, *Wiehler & GRF Expedition 86249* (HOLOTYPE: GES; Isotypes: QCA,F,K,MO,NY,SEL,U,US).

P. isernii (Cuatrecasas) Wiehler affinis, sed foliorum marginibus integris, floribus non solitariis, et calicem lobis sine laciniis notabilis.

Epiphytic, perennial herb. the *stems* ascending, spreading, rarely branching, 2-3 m long, defoliated except for the ca. 20 cm, 0.6-1.5 cm in diameter, brownish tan, sericeous-woolly (the prominent indumentum of stems, petioles, abaxial leaf laminae, prophylls, pedicels and calices appearing white), with internodes 1-5 cm long; *leaf* pairs equal or subequal, the petiole ca. 1.5 cm long, white woolly, the lamina lanceolate, 4-7 by 2.0-3.5 cm, acuminate, entire, ciliate, cuneate, darker green and sericeous above, lighter green and sericeous-woolly (white woolly along the veins) below, with 5-6 pairs of secondary veins. *Inflorescence* a reduced axillary cyme of 1-4 flowers, the peduncle absent, the prophylls lanceolate-subulate, 8 by 1 mm, white woolly, the pedicels ca. 1.2 cm long, white woolly; *calyx* conical, white woolly, the lobes equal, lanceolate, spreading, 8 by 3 mm, entire, the margins of the red apices recurved, causing the tips of the lobes to be concave; *corolla* erect in the calyx, tubular, ca. 2.3 cm long, slightly constricted above the cream-white, sericeous spur, the tube pale orange-pink, densely covered with 4 mm long red celled trichomes, inflated at midpoint, again constricted below the small (1.5 by 1.5 mm), barely spreading red marked lobes, the inside of the tube pubescent; *stamens* 4, included, the white, pubescent filaments ca. 1.6 mm long, adnate to the base of the corolla tube for 6 mm, the anthers syngenesous, 1 by 1 mm; *ovary* superior, 2 mm long at anthesis, glabrous, the style ca. 1.3 cm long, white, glabrous, the stigma stomatomorphic; *nectary* consisting of 5 glands, with the 2 dorsal ones connate. *Fruit* a globose, white, glabrous berry, ca. 9 mm in diameter; *seed* fusiform, striate, tan, 1 mm long, with a fleshy funicle 2.3 mm long.

***Pentadenia rubriacuta* Wiehler, sp. nov.** TYPE: ECUADOR. El Oro: road Loja - Santa Rosa, ca. 20 km past Piñas, below cloud forest, 1000 m altitude, on slope of roadcut, 17 April 1986, *Wiehler & GRF Expedition 8648* (GES). Grown from live cuttings of this collection in GRF greenhouse, accession no. G-3200, type specimens prepared 8 July 1990, *Wiehler 90175* (HOLOTYPE: GES; Isotypes: QCA,B,F,HBG,K,MO, NY,SEL,U,US, others to be distributed).

A *P. zapotalana* Wiehler magnitudine coloreque corollarum, calicum lobis ellipticis et prophyllis ovatis recedit.

Epiphytic (occasionally terrestrial in disturbed areas) perennial herb, the *stems* erect, spreading or ascending, 0.6 to 1.2 m long, 0.7-1.0 cm in diameter, tawny, covered with small scales, sparsely pilose, with internodes ca. 2 cm long; *leaf* pairs very unequal, the petiole 0.9-1.2 cm long, green, pilose, the lamina of the larger leaf of a pair oblanceolate or elliptic, 10-12 by 4-6 cm, acute, weakly serrulate, ciliate, strongly oblique, green and sericeous on both surfaces, the abaxial tip red, with 5-7 pairs of secondary veins; the lamina of the smaller leaf of a pair similar, ca. 1.5 by 1.0 cm. *Inflorescence* a reduced

axillary cyme of 1-4 flowers, in the axil of the larger leaf of a pair, the peduncle absent, the prophylls ovate, ca. 1.3 by 0.8 cm, yellow-green, distally flushed with rose-pink, the subtending bracts similar, ca. 6 by 2 mm, the pedicels 3 mm long; *calyx* conical, cream-white, sericeous, the lobes unequal, elliptic, entire, ciliate, cream-white or yellow-green near the base, but mostly rose-pink, pilose-sericeous, the dorsal and the 2 lateral lobes smaller, 6-9 by 2-3 mm, the lower 2 lobes larger, 8-12 by 3-5 mm; *corolla* oblique in the calyx, tubular, 1.5-1.8 cm long, constricted above the cream colored and glabrous spur, bent above the constriction, red, pink, or orange-pink, pilose-sericeous, the lobes equal, not spreading, 1 by 1 mm, orange, the tube inside glabrous; *stamens* 4, included, the white, pubescent filaments ca. 1.7 cm long, adnate to the base of the corolla for 4-5 mm, the anthers syngenesous, 1 by 1 mm; *ovary* superior, 2-3 mm long at anthesis, green, pubescent, the style ca. 1.5 cm long, white, pubescent and with short capitate glandular hairs, the stigma bifid; *nectary* consisting of 5 white, glabrous glands, the dorsal 2 connate. *Fruit* a globose, white, pilose berry, ca. 1 cm in diameter; *seed* fusiform, striate, tan, 0.9 mm long, with a fleshy funiculus 1.6 mm long.

Pentadenia tandapiana Wiehler, *sp. nov.* TYPE: ECUADOR. Pichincha: 7 km from San Miguel de los Bancos on road to Mindo, deforested, agricultural area, on tree in meadow along roadside, corollas yellow, 30 April 1990, *Wiehler & GRF Expedition 90133* (HOLOTYPE: GES; Isotypes: QCA,US).

A *P. ecuadorana* Wiehler calicum lobis integris et corollis parvioribus luteis statim dignoscenda.

Epiphytic, perennial herb, the *stems* ascending, spreading, branching, to 30 cm long, often defoliated near the base, 0.5-1.3 cm in diameter, brownish tan, scaly, glabrescent, with internodes 1.5-5.0 cm long; *leaf* pairs strongly unequal, the petiole ca. 7 mm long, green, sericeous, the lamina of the larger leaf of a pair elliptic or lanceolate, 6-9 by 2-3 cm, acuminate, entire, ciliate, oblique, green, sparsely sericeous on both surfaces, occasionally with abaxial red spots or with red margins (in sun grown specimens), with 4-6 pairs of secondary veins. *Inflorescence* a reduced axillary cyme of 1-8 flowers, the peduncle absent, the prophylls minute, subulate, 3 by 1 mm, often caducous, the pedicels 5-7 mm long, green sericeous; *calyx* conical, green, sericeous, the lobes subequal, lanceolate-linear, slightly spreading, 1.0 by 0.15 cm, entire, green; *corolla* erect in the calyx, tubular, 1.8-2.1 cm long, constricted above the cream-white, glabrous spur, the tube yellow, sericeous-pilose, the equal sized lobes, 2 by 2 mm, slightly spreading, the tube inside pubescent; *stamens* 4, included, the white, glabrous filaments ca. 1.9 cm long, adnate to the base of the corolla tube for 4 mm, the anthers syngenesous, 1 by 1 mm; *ovary* superior,

3 mm long at anthesis, glabrous, the style ca. 1.7 cm long, white, glabrous, apically bent like a shepherd's crook, the stigma bilobed; *nectary* consisting of 5 glands, the dorsal 2 connate. *Fruit* a globose, glabrous berry, ca. 7 mm in diameter; *seed* fusiform, striate, tan, 0.9 mm long, with a fleshy funicle 1.8 mm long.

Rhoogeton panamensis Wiehler, *sp. nov.* TYPE: PANAMA. Coclé: El Valle de Antón: La Mesa, 19 June 1978, Dressler s.n., live material cultivated at SEL and GRF greenhouse, accession no. G-2633, type material prepared 8 July 1985. *Wiehler 8536* (HOLOTYPE: GES; Isotypes: PMA,K,MO,NY,SEL,US).

Differt a *Rhoogeto viviparo* Leeuwenberg foliis longioribus lanceolatis decurrentibus et corollis albis.

Terrestrial, perennial, tuberous, acaulescent herb, to 35 cm tall, the underground tuber ca. 2.5 cm in diameter (or larger), the *leaves* erect or spreading, longer than the inflorescences, with 9-14 blades per plant; petioles ca. 6 cm long, reddish maroon, glabrescent, the lamina lanceolate-elliptic, ca. 25 by 6 cm, acuminate (occasionally acute), double serrate, long decurrent, green, glabrous to glabrescent, the midvein abaxially as maroon as the petiole, the secondary pairs of veins 8-11. *Inflorescences* pseudo-umbellate, compound, pair flowered cymes arising on long peduncles from the leaf axils, each umbel with 10-20 flowers, the peduncle ca. 18 cm long, reddish maroon, glabrescent, the prophylls and subtending bracts lanceolate-elliptic, 1.6-2.1 by 0.3-0.4 cm, entire, green, sparsely sericeous, the pedicels ca. 1 cm long, green, glabrescent; *calyx* lobes equal sized, lanceolate, ca. 1.2 by 0.4 cm, with a few teeth near the apex, green, sericeous; *corolla* oblique in the calyx, tubular-infundibular, ca. 2.5-3.5 cm long, with a small spur and a flaring limb, white (pale pink in strong sunlight), sparsely sericeous-pilose, the upper 4 lobes of the limb subequal, ca. 7 by 7 mm, the lower lobe ca. 9 by 9 mm, the margins wavy, entire, the face of the limb with a pink flush, the tube inside with rose longitudinal lines and a ventral yellow nectar guide; *stamens* 4, included, ca. 1.4 cm long, white, glabrous, adnate to the base of the corolla tube for 4 mm, the anthers coherent into a square, each anther 0.8 by 0.8 mm, the thecae dehiscent by longitudinal slits; *ovary* superior, turbinate, 3 mm long, sericeous, the style ca. 1.2 cm long, white, with capitate glandular trichomes, the stigma stomatomorphic; *nectary* a double connate, dorsal gland, 1.0 by 1.4 mm, maroon. *Fruit* a bivalved capsule; *seed* not seen.

Smithiantha canarina Wiehler, *sp. nov.* TYPE: MEXICO. Oaxaca: Area of Temascal, near dam overflow of Presa Miguel Alemán, on rock outcroppings in forest above road; whitish rhizomes of dormant plants and

dried up stalks with seed pods in small crevices filled with humus, 24 April 1991, *Wiehler, Lau, & GRF Expedition 9105* (GES). Grown from same rhizomes in GRF greenhouse, accession no. G-3584, first flowers 24 Nov. 1991; specimens prepared 6 Dec. 1991, *Wiehler 91240* (HOLOTYPE: GES; Isotypes: BH,K,MEXU,NY,SEL,US, others to be distributed).

A. S. multiflora (Martens & Galeotti) Fritsch corollis canarinis, tubis angustioribus longioribusque, ventraliter sine sulcis prominentibus, et lobis parvioribus bene distincta.

Terrestrial herb with underground rhizomes consisting of compacted, thick, succulent leaf scales, each rhizome ca. 2.3 by 1.0 cm, cream-white, glabrous; *stems* erect or ascending, rarely branching, 50-60 cm tall, ca. 9 mm in diameter, pale green, with elongated whitish lenticels, puberulous, the internodes 4-5 cm long; *leaves* opposite decussate, of equal size, the petioles 4-5 cm long, ca. 5 mm in diameter, pale green, puberulous, the lamina cordate, ca. 5 by 5 cm, acute, crenate, leathery stiff, adaxially dark green, hirsute, abaxially lighter green suffused with maroon, puberulous, the secondary pairs of veins 4. *Inflorescence* an apical raceme of 20+ flowers in an alternate arrangement (=typically for the genus), ca. 36 cm long, all green parts puberulous, with scattered capitate glandular trichomes, the bracts lanceolate, green, the pedicels ca. 1 cm long, green, the hypanthium at anthesis 4 mm long, dark green, the *calyx* lobes equal, lanceolate, 5 by 3 mm, medium green; *corolla* almost erect in the calyx, tubular-infundibular, the tube nodding, gradually widening, distally bent upwards, dorsally with 2 prominent longitudinal grooves, ca. 3.5 cm long, proximally 0.7 cm, distally 1.1 cm in diameter, canary yellow (R.H.S. Colour Chart: Yellow Group 9 C), puberulous, with scattered capitate glandular trichomes, the limb ca. 1.5 cm in diameter, deeper canary yellow (Yellow Group 9 A), with short capitate glandular trichomes, the lobes equal, rounded, ca. 6 by 6 mm, the tube inside yellow, ventrally with 3 faint orange nectar guides, the throat covered with short capitate glandular trichomes; *stamens* 4, included, adnate to the base of the corolla tube for 2 mm, ca. 2.6 cm long, white, pilose, the anthers coherent into a square, each anther 1.0 by 0.9 mm, the thecae parallel, dehiscing by longitudinal slits; *ovary* semi-inferior, turbinate, ca. 7 mm long, pale green, pubescent, the style ca. 2.3 cm long, white, pubescent-pilose, the stigma stomatomorphic; *nectary* a ring, ca. 1.5 mm high, with thickenings in the 2 lateral and the dorsal areas, grayish white, glabrous. *Fruit* a dry, bivalved capsule, ca. 1.4 cm long, splitting loculicidally; *seed* fusiform, ca. 0.6 by 0.3 mm, striate, light brown.

Smithiantha laui Wiehler, *sp. nov.* TYPE: MEXICO. Oaxaca: About halfway between Valle Nacional and Oaxaca on road no. 75. On almost

vertical rocks of roadside cut, dripping with water. Whitish rhizomes, dried up plant stalks, and a few small plants in flower. Area wet, at the beginning of the rainy season. Plants fully sun exposed or in partial shade, altitude 1100 m; 25 April 1991, *Wiehler, Lau, & GRF Expedition 9117* (GES). Grown from the above cited rhizomes in GRF greenhouse, accession no. G-3588, first flowers 29 November 1991; specimens prepared 6 December 1991, *Wiehler 91241* (HOLOTYPE: GES; Isotypes: BH,K,MEXU,NY,SEL,US, others to be distributed.)

Inter species generis corollarum forma et colore purpurea differt.

Terrestrial herb with underground scaly rhizomes, ca. 2.5 by 1.0 cm, cream-white, glabrous; *stems* erect or ascending, rarely branching, 30-50 cm tall, 0.5-1.4 cm in diameter, succulent, pale green or deep maroon with elongated green lenticels, densely hirsute, the multicellular, uniseriate trichomes clear celled or filled with anthocyanin, the internodes 2-4 cm long; *leaves* opposite decussate, of equal size or unequal, the petioles 2.5-5.5 cm long, near the base 0.8 cm in diameter, succulent, of the same color and indumentum as the stems, the lamina broadly cordate, 9-12 by 9-12 cm, acute, crenate, adaxially dark green or maroon, hirsute, abaxially lighter green or lighter maroon, hirsute, the secondary pairs of veins 4-6. *Inflorescence* an apical raceme of 18+ flowers in an alternate arrangement, to 40 cm long, green or maroon, hirsute, mixed with capitate glandular trichomes, bracts 0.4 cm long, lanceolate, pedicels 2.0-3.5 cm long, green or maroon, hypanthium at anthesis conical, 4 mm long, *calyx* lobes broadly lanceolate, spreading, almost equal in size, 3.0 by 1.5 mm, green or maroon, hirsute, with capitate glandular trichomes; *corolla* nearly erect in the calyx, infundibular, 4 cm long, the tube ca. 1.3 cm in diameter at midpoint, lavender-purple (Purple Group 77 C), sparsely hirsute, with capitate glandular trichomes, the limb ca. 2.3 cm in diameter, the lobes rounded, of almost equal size, each 7 by 8 mm, entire, lavender-purple, with deeper purple spots outlined in white, pubescent, the throat and tube inside ventrally with three golden yellow nectar guide lines and spotted with purple; *stamens* 4, included, adnate to the base of the corolla tube for 2 mm, ca. 2.8 cm long, white, pubescent, the anthers coherent into a square, each anther 1 by 1.8 mm, the thecae parallel, dehiscing by longitudinal slits; *ovary* semi-inferior, turbinate, ca. 4 mm long, green, pubescent, the style ca. 1.6 cm long, white, sparsely pilose, the stigma stomatomorphic; *nectary* ring shaped, ca. 1.5 mm tall, enlarged in the 2 lateral and in the dorsal areas, white, glabrous. *Fruit* a dry, bivalved, pointed capsule, ca. 1.6 cm long, splitting loculicidally; *seed* fusiform, 0.5 by 0.2 mm, striate, reddish brown.

A NEW SPECIES OF *CYMOPHORA* (ASTERACEAE, HELIANTHEAE) FROM GUERRERO, MEXICO

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ABSTRACT

A new species of *Cymophora*, ***C. luckowana*** B. Turner, is described from central Guerrero, México. It is closely related to *C. pringlei* but is readily distinguished by its larger, coarsely serrate leaves, eglandular stems, fewer florets per head and appressed strigose achenes. An illustration of the new taxon is provided along with a key and map to help distinguish among the four presently known species.

KEY WORDS: *Cymophora*, Asteraceae, Heliantheae, México

Routine identification of Mexican Asteraceae has revealed the present novelty.

Cymophora luckowana B. Turner, *sp. nov.* TYPE: MEXICO. Guerrero: "Canyon 1.5 km E of Acahuizotla. Tropical forest next to river." 28 Sep 1987, *Melissa Luckow 3568* (HOLOTYPE: TEX!; Isotypes: BH, MEXU, NY).

Cymophorae pringlei B. Robinson similis sed trichomatibus caulium eglandulosis (vs. glandulosis), foliorum laminis deltoideis (vs. ovatis) multo majoribusque marginibus grosse dentatis (vs. subser-ratis vel integris), flosculis paucioribus (5-7 vs. 10-40) in quoque capitulo, et acheniis strigosis (vs. dense villosis) differt.

Annual stiffly erect herbs ca. 60 cm high. Stems sparsely pilose with multiseptate hairs. Leaves on primary shoots opposite, 10-15 cm long, 7-10 cm wide; petioles mostly 1.5-5.0 cm long, sparsely pubescent like the stems; blades decidedly deltoid, glabrous or nearly so, with 3 principal nerves arising from somewhat above the base, tapering upon the petioles, the margins coarsely

and irregularly dentate, the basalmost dentation usually extended into a pronounced, often deflexed, lobe. Capitulescence an open subpaniculate cyme ca. 15 cm high, 25 cm wide, the ultimate peduncles mostly 5-10 mm long, moderately to densely appressed pilose with eglandular multiseptate trichomes. Involucres cylindric, 3.0-3.5 mm long, 2.2-2.5 mm wide (pressed), the bracts biseriate, subequal, the outer series elliptic-lanceolate, 4-5 in number, glabrous or nearly so. Receptacle convex, paleate, the pales broadly lanceolate, scarious, ca. as long as the bracts. Florets 5-7 per head, the 1-2 outermost florets with perfect but somewhat zygomorphic corollas, the inner florets with more or less regular corollas with glandular pubescent tubes ca. 1 mm long, throats ca. 2 mm long, and lobes ca. 0.5 mm long. Achenes 4-5 sided, narrowly obpyramidal, epappose, ca. 2 mm long, 0.8 mm wide, black striate, appressed strigose.

Cymophora luckowana is closely related to *C. pringlei* but is readily distinguished by the characters noted in the Latin diagnosis. It might also be compared with *C. hintonii* Turner & Powell from Jalisco and Michoacán (cf. distribution map, Fig. 2). These several taxa and that of *C. venezuelensis* (Aristig. & Cuatr.) Canne can be distinguished by the characters given in the following couplets.

1. Ray or peripheral florets pistillate; Venezuela. *C. venezuelensis*
1. Ray or peripheral florets perfect; México. (2)
 2. Achenes appressed strigose; leaf blades deltoid, coarsely dentate with basal flanges; stems without glandular trichomes; central Guerrero. *C. luckowana*
 2. Achenes, when pubescent, pilose; leaf blades ovate to flabellate, serrate to subentire, without basal flanges; stems to some degree with glandular trichomes. (3)
3. Florets 8-10 per head; leaf blades flabellate, 4-5 cm wide; Jalisco and Michoacán. *C. hintonii*
3. Florets 10-40 per head; leaf blades ovate, 1.0-3.5 cm wide; Jalisco, Michoacán, and Guerrero. *C. pringlei*

It should be noted that Turner & Powell (1977) positioned all of these species in *Cymophora*, but Keil, Luckow, & Pinkava (1987) would position them in *Tridax*, primarily on the grounds that both genera appear to have base numbers, at least in part, of $x=9$. I take the view that *Cymophora* is sufficiently morphologically removed from *Tridax* so as to be recognized as distinct regardless of its base number. Indeed, it appears to stand somewhere



Fig. 1. *Cymophora luckowana*, from holotype.



Fig. 2 Distribution of *Cymophora hintonii* (open triangles), *C. pringlei* (closed circles), and *C. luckowana* (open circle).

between *Sabazia*, *Galinsoga*, and *Tridax*, but not clearly referable to any of these, as noted by Turner, Powell, & Watson (1973). Generic relationships in the subtribe Galinsoginae are in much need of critical re-evaluation, as noted by Turner (1990, and references therein). Dr. José Panero is currently working on this complex using DNA sequence data, which might help resolve some of the more intractable problems within the group.

ACKNOWLEDGMENTS

I am grateful to Guy Nesom and Mahinda Martínez for reviewing the manuscript.

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A NEW SPECIES OF *CASTILLEJA* SECT. *EUCHROMA*
(SCROPHULARIACEAE) FROM OAXACA, MEXICO

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ABSTRACT

A previously undescribed species of *Castilleja* is recognized from near the summit of Cerro Zempoaltepetl in Oaxaca: *C. zempoaltepetlensis*. It is a member of sect. *Euchroma* (Nutt.) Benth. distinguished from relatives by its combination of thin rhizomes, sparsely pubescent leaves and stems, strongly dissected leaves and bracts, apparently whitish or yellowish calyces not narrowed at the midregion, and corollas with a densely bearded galea. The new species is most closely related to *C. toluensis*, which also is restricted to high elevation habitats. A key is provided to eleven Mexican (mainland) species of sect. *Euchroma* with lobed or divided leaves.

KEY WORDS: *Castilleja*, Scrophulariaceae, México

Castilleja zempoaltepetlensis Nesom, *sp. nov.* TYPE: MEXICO. Oaxaca: vicinity of Cerro Zempoaltepetl, open pine forests on SE slopes of peak, ca. 3200 m, infrequently abundant only on summit, 10 Aug 1950, B. Hallberg 898 (HOLOTYPE: LL!; Isotype: MICH!).

Castillejae toluensis Kunth similis sed calycibus eglandulosis sparsim hispido-pilosisque absque colore rubro, foliis 2-4 lobatis, lobis fere filiformibus apicibus acutis, et corollis calyce exsertis 8-10 mm differt.

Perennial (?) herbs arising from long, slender rhizomes, the stems and leaves with shiny surfaces, with stipitate glands and eglandular hairs. Stems 12-20 cm tall, sparsely villous with loose, spreading, vitreous hairs 0.4-1.0 mm long, some of them gland tipped, especially near the inflorescence. Leaves evenly spaced along the stems, barely or not at all subclasping, oblong-lanceo-

late, 25-30 mm long at midstem, pectinately dissected, with 2-4 pairs of linear-lanceolate lobes with an acute apex, the lowermost leaves 10-15 mm long, linear-oblong, and entire, becoming larger and more highly dissected toward the inflorescence, sparsely hispid-strigose to sparsely villous, mostly along the veins. Flowers sessile in a dense, terminal, spicate cluster, the internodes elongating in fruit. Floral bracts distinctly differentiated from the upper leaves, the lobe apices reddish, broadening and becoming rounded, the uppermost bracts obovate-spatulate with a crenate apex. Calyx apparently evenly whitish or cream, even in width from base to tip, 17-21 mm long with primary lobes 9-12 mm long and equal in length, rounded at the apex without secondary lobes, vestiture like the leaves. Corollas 27-29 mm long, the lower lip of 3, green, thickened teeth ca. 1 mm long, the galea ca. 16 mm long, yellow-green with red flanges, densely bearded near the apex, exerted 8-10 mm from the calyx. Capsules ovoid, 9-11 mm long.

Additional collection examined: MEXICO. Oaxaca: Vicinity of Cerro Zempoaltepetl, around Indian altars at the summit, in open pine woodland, ca. 3396 m, 23 Jul 1950, *Hallberg 742* (LL,MICH).

Castilleja zempoaltepetlensis is distinguished from other species of *Castilleja* sect. *Euchroma* (Nutt.) Benth. in México by its combination of thin rhizomes, sparsely pubescent leaves and stems, strongly dissected leaves and bracts, calyces of even width, apparently whitish or yellowish without red coloration, and corollas with a densely bearded galea. The two collections cited here of the new species were distributed as *C. konzattii* Fern. Both species are members of *Castilleja* sect. *Euchroma* (Nutt.) Benth. (sensu Eastwood 1909) and are superficially similar in their divided leaves. In its rhizomatous habit and calyx of even width, however, *C. zempoaltepetlensis* is similar to *C. tolucensis* Kunth, another species restricted to high elevation habitats. In México, these two species form a distinct pair apparently not closely related to any others. *Castilleja konzattii* is more closely related to *C. falcata* Eastw. and other species morphologically similar to *C. scorzoneraefolia* Kunth (Nesom 1992).

Species of sect. *Euchroma* from mainland México with lobed to divided leaves do not form a natural group, but for convenience of identification, they are grouped together in the provisional and artificial key below. The species definitions and relationships among *C. falcata*, *C. konzattii*, *C. scorzoneraefolia*, and *C. hirsuta* Mart. & Gal. are in need of detailed study.

1. Woody shrubs densely invested with dendritic hairs; central Oaxaca. ...
..... *C. dendridion* Nesom
1. Herbs, sometimes with slightly woody bases, sparsely to densely invested
with unbranched hairs. (2)
2. Calyces distinctly narrowing at ca. midlength, then broadening again
toward the apex; plants arising from woody taproots. (4)

2. Calyces even in width from base to apex; plants arising from slender rhizomes. (3)
3. Calyx with red, densely glandular puberulent apex; leaves trilobed, lobes with rounded apices; corollas included within the calyx; Edo. México, Puebla, Veracruz (Nevado de Toluca, Ixtaccihuatl, Popocatepetl, Orizaba, Perote). *C. tolucensis* Kunth
3. Calyx without red coloration, sparsely hispid-pilose, eglandular; leaves 2-4 lobed, lobes nearly filiform with acute apices; corollas exerted 8-10 mm from the calyx; Oaxaca (Cerro Zempoaltepetl).
..... *C. zempoaltepetlensis* Nesom
4. Plants usually single stemmed from the base, always with an erect stem. (6)
4. Plants caespitose, tending to be acaulescent. (5)
5. Calyx green, the veins and lobe margins sparsely pilose with loosely spreading, vitreous hairs; leaves mostly 4-6 mm wide at midpoint; Nuevo León and Coahuila. *C. bella* Standley
5. Calyx cinereous, the veins and lobe margins densely ciliate with stiffly spreading, white hairs; leaves mostly 1-3 mm wide at midpoint (below the divergence of the lobes); Hidalgo, México, Puebla. *C. moranensis* Kunth
 6. Plants annual from a very slender, short taproot; Edo. México to Durango. (8)
 6. Plants perennial with a woody, thickened root; Veracruz to Oaxaca. (7)
7. Calyx with a red apex; Veracruz and Puebla (Orizaba and Perote).
..... *C. falcata* Eastw.
7. Calyx completely green except for a yellow, narrow but prominent apical rim; Oaxaca. *C. konzattii* Fern.
 8. Calyx green with a prominently red apex; stems sparsely invested with spreading hairs, stipitate glandular hairs usually present. (10)
 8. Calyx greenish to yellow, commonly without red coloration (sometimes barely red at the apex in *C. sphaerostigma*); stems with deflexed or retrorsely appressed hairs, eglandular. (9)
9. Stems moderately invested with thin, antrorsely appressed hairs; basal leaves pectinately lobed, the cauline entire; floral bracts lanceolate, entire; stigmas with lobes 2 mm long; Edo. México and eastern Michoacán.
..... *C. macrostigma* B. Rob.

9. Stems densely invested (nearly floccose in the inflorescence) with relatively thick, deflexed hairs; lower and cauline leaves usually with 1-3 pairs of linear lobes; floral bracts with apex somewhat dilated and shallowly lobed or distinctly scalloped to coarsely crenate; stigmas nearly capitate (thickened and slightly notched); west central Zacatecas and adjacent Durango. *C. sphaerostigma* Eastw.
10. Leaves with filiform lobes; floral bracts entire; northwestern Michoacán. *C. jilquilpana* Nesom
10. Leaves with oblanceolate to spatulate lobes; floral bracts lobed; Durango. *C. saltensis* Eastw.

ACKNOWLEDGMENTS

I thank Dr. B.L. Turner and Mark Mayfield for their review of the manuscript and the staff of GH for a loan of specimens.

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A NEW SPECIES OF *STEMODIA* (SCROPHULARIACEAE)
FROM COSTA RICA

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ABSTRACT

A new species, *Stemodia costaricensis* B. Turner, is described from Cartago Province, where it is apparently locally abundant. It is known by twenty or more collections, all from the vicinity of Tapanti. The species is closely related to *S. reliquiarum* D'Arcy of Chiriquí Province, Panamá, but is readily distinguished by several consistent characters including leaf shape, lack of vestiture, and corolla size and shape. A key to the two taxa is provided along with a map showing their distribution.

KEY WORDS: *Stemodia*, Scrophulariaceae, Costa Rica, Panamá

D'Arcy (1979) described a new species of *Stemodia*, *S. reliquiarum* D'Arcy from Panamá. It is remarkable within *Stemodia* because of its pubescent, seemingly sessile anthers, and he commented that it "might warrant recognition at the generic level." Discovery of the present species, which contains the essential elements of *S. reliquiarum*, including pubescent anthers, adds an additional taxon to the complex concerned. The following couplet will distinguish between the two taxa:

Leaves mostly broadly ovate to subdeltoid; pedicels and sepals glabrous; corollas strongly bilabiate (*Lobelia*-like), the central lower lobe 4-6 mm long; Costa Rica (Cartago Province). *S. costaricensis*

Leaves mostly ovate-lanceolate; pedicels and sepals glandular hirsute; corollas not strongly bilabiate, the central lower lobe 2-3 mm long; Panamá (Chiriquí Province). *S. reliquiarum*



Fig.1. Distribution of *Stenodia costaricensis* (open circle) and *S. reliquiarum* (closed circle) in Costa Rica and Panama respectively.

Stemodia costaricensis B. Turner, *sp. nov.* TYPE: COSTA RICA. Cartago Province: "1-4 km beyond first bridge within Hydroelectric Plant Property (Instituto Costaricensis Electricidad) enroute to the reservoir at the road terminus." 4800-4900 ft, common but very local, 4 Mar 1981, *F. Almeda & K. Nakai* 4734 (HOLOTYPE: TEX!; Isotype: CAS).

Stemodiae reliquiaro D'Arcy sed foliis late ovatis (vs. lanceolatis-ovatis), pedicellis ac calycibus glabris (vs. pilosis), et corollis majoribus lobis longissimis 4-6 mm longis (vs. 2-3 mm) differt.

Sprawling or trailing suffruticose glabrous perennial herbs 10-100 cm long, 1.0-1.8 cm wide; petioles mostly 3-8 mm long; blades broadly ovate to triangular ovate, trinervate, minutely punctate beneath, the margins serrulate. Flowers arranged in terminal bracteate racemes 3-8 cm long, the pedicels glabrous, mostly 8-14 mm long. Calyx glabrous, ebracteolate, mostly 3-4 mm long, the lobes essentially alike and free to the base. Corollas reportedly deep violet blue and "*Lobelia*-like," the tube ca. 3 mm long, the upper 2 lobes 2.5-3.0 mm long, the lower 3 lobes mostly 3-6 mm long, the central lobe 4-6 mm long. Capsule ovate, ca. 4 mm long. Seeds numerous, brown, ovoid, finely reticulate, ca. 0.5 mm long.

ADDITIONAL SPECIMENS EXAMINED: COSTA RICA. Cartago: Instituto Costaricensis de Electricidad, ca. 13 km beyond the bridge at Tapanti, 1400-1600 m, 10 Jul 1977, *Almeda* 3022 (CAS,F); Refugio Nacional de Fauna Silvestre Tapanti, along river just beyond Puente dos Amigos, 1500 m, 23 Mar 1986, *Almeda* 5761 (TEX); ca. 10 km S of Tapanti, ca. 1600 m, 14-17 Jul 1971, *Burger* 7537 (DUKE); Tapanti Hydroelectric Reserve, along Río Dos Amigos, 1600-1700 m, 23 Jun 1976, *Croat* 36214 (F,MO); Tapanti Watershed Preserve, ca 20 mi SW of Paraiso, 5 Feb 1979, *Croat* 46990 (MO); 12 km S of Tapanti, 1520 m, 5 Nov 1967, *Lent* 1454, 1571 (F); Tapanti, mountain above town, ca. 1500 m, 23 Jun 1972, *Primack* 180 (DUKE); ca. 12 km from the bridge at Tapanti, 1400-1500 m, 11 Aug 1981, *Taylor* 1338 (DUKE); 7-12 km SE of Orosi, 1400-1600 m, 12 May 1975, *Utley* 2500 (F); wooded slopes above Río Grande de Orosi, 1400-1700 m, 18 Feb 1976, *Utley* 4157 (DUKE); and all of the following collections by R.L. Wilbur of DUKE which were collected in the same general region about Tapanti: 18068, 18495, 22385, 22434, 30795, 30875, 32939, 33083.

The twenty or more collections cited above were all obtained from the vicinity of Tapanti and all are exceedingly uniform. D'Arcy (1979) cited one of these (*Croat* 36214) as belonging to his concept of *Stemodia reliquiarum*. The two taxa, while closely related, are clearly distinct and by "specific standards" established in the genus *Stemodia* by previous workers appear to be worthy of specific rank.

ACKNOWLEDGMENTS

I am grateful to Guy Nesom for the Latin diagnosis and to him and Carol Todzia for reviewing the manuscript.

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A NEW SPECIES OF *STENOCARPHA* (ASTERACEAE, HELIANTHEAE,
GALINSOGINAE) FROM MEXICO

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ABSTRACT

A new species *Stenocarpa ritovegana* B. Turner, is described from the vicinity of Surutato, Sinaloa. It differs from the only previously known species of the genus, *S. filiformis* (Hemsl.) S.F. Blake, in having slender rhizomes and 1-3 much larger heads borne upon elongate peduncles.

KEY WORDS: *Stenocarpa*, *Galinsoga*, Asteraceae, Heliantheae, Galinsoginae, México, Sinaloa

Routine identification of Mexican Asteraceae has revealed the following novelty.

Stenocarpa ritovegana* B. Turner, *sp. nov. Fig. 1. TYPE: MEXICO. Sinaloa: Mpio. Badiraguato, alrededores de Surutato, bosque de pino, 1600-1800 m, 11 Dec 1987, *Rito Vega 2593*, with F. Hernández y A. Hernández (HOLOTYPE: TEX; Isotype: EACS).

Stenocarphae filiformi (Hemsl.) S.F. Blake similis sed differt plantis perennis rhizomatibus tenuibus exorientibus (vs. annuis radice palari exorientibus), capitulis majoribus (12-15 mm latis trans radios expansos vs. 5-8 mm), et capitulescentia capitulis paucioribus instructa (1-3 per caulem vs. 5-numerosis).

Erect scapose perennial herbs 20-30 cm high. Stems mostly less than 1 mm in diameter, arising from slender rhizomes. Leaves all basal, occasionally 1 or 2 pairs of much reduced stem leaves, 2-4 cm long, 1.0-1.5 cm wide; petioles 5-10 mm long; blades lanceolate to oblanceolate, tapering upon the petioles,

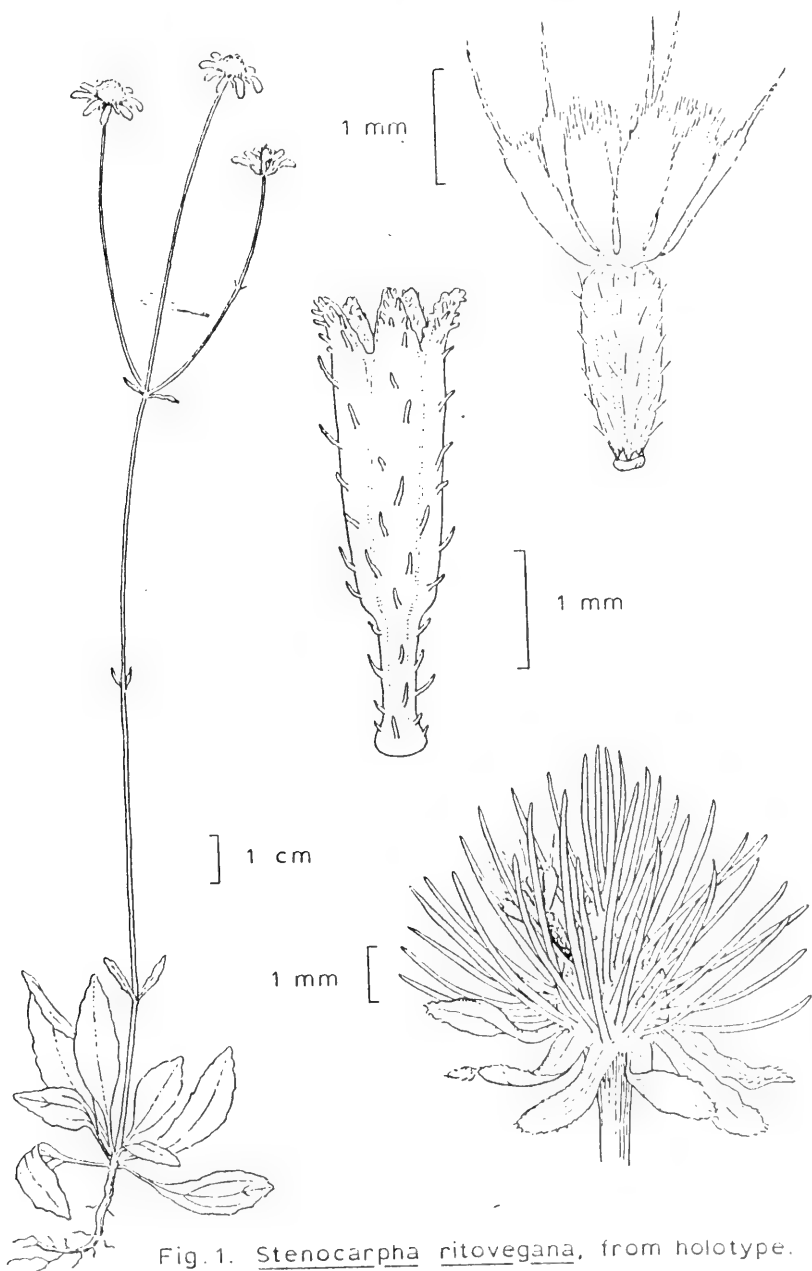


Fig.1. *Stenocarpa ritovegana*, from holotype.

glabrous or nearly so, trinervate to subpinnately nervate, the margins crenulodenticulate. Heads 1 to 3 to a stem, the common peduncle up to 15 cm long, the ultimate peduncles mostly 4-10 cm long. Involucres campanulate, 3-4 mm high, 6-7 mm across, the bracts 2-3 seriate, subequal, linear-elliptic, glabrous, striate, the apices obtuse or rounded. Receptacle conical, ca. 2 mm across at the base, ca. 3 mm high, the bracts linear, persistent, 2.5-3.0 mm long, ca. 0.15 mm wide. Ray florets ca. 11, pistillate, fertile, not forming a complex with the pales as in *Galinsoga*, the ligules white, 3-6 mm long, ca. 2 mm wide, the tube ca. 1.5 mm long. Disk florets numerous, the corollas yellow, ca. 2 mm long, the tube hispidulous, ca. 0.6 mm long, the lobes minutely hispidulous, ca. 0.25 mm long. Achenes, those of the ray similar to those of the disk but epappose, those of the disk black, striate, narrowly obpyramidal, somewhat 4 sided, ca. 1 mm long, 0.3 mm wide, moderately strigose, the pappus of ca. 8 persistent white lanceolate scales, 1.0-1.5 mm long, erose at the apices, 4 of these usually possessing setaceous awns.

Canne (1977) would have presumably positioned this taxon in the section *Elata* of her concept of the genus *Galinsoga*, where it would nestle next to its previously only known species, *G. filiformis* Hemsl. Blake elevated *G. filiformis* in taxonomic rank to the monotypic genus *Stenocarpa*, and Turner (1965) maintained the genus, but it must be admitted that the generic lines among phyletic groupings in the subtribe Galinsoginae are tenuous at best, as painfully noted by Turner (1990). Regardless, in my treatment for México, I intend to restrict *Galinsoga* to those species having an achene/phyllary complex that falls as a unit at maturity. *Stenocarpa*, which lacks such a complex, might ultimately be found to be related more closely to *Sabazia* than to *Galinsoga*. Whatever the generic lines, there can be little doubt that the present species belongs within *Stenocarpa* since it contains all of the previously described characters of that group, except for the few headed capitulescence and rhizomatous habit.

ACKNOWLEDGMENTS

I am grateful to Guy Nesom for the Latin diagnosis and to him and Dr. T.P. Ramamoorthy for reviewing the manuscript. Nancy Webber provided the illustration.

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A NEW COMBINATION IN *HEMIZONIA* (ASTERACEAE: MADIINAE)

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ABSTRACT

Hemizonia leucocephala Tanowitz is reduced to subspecific rank as
***H. congesta* DC. ssp. *leucocephala* (Tanowitz) Keil.**

KEY WORDS: *Hemizonia*, Asteraceae, Madiinae

Based on examination of types and a review of the application of names, Tanowitz (1983) recognized that the taxon that had been treated in recent floras as *Hemizonia multicaulis* Hook. & Arn. should properly be called *H. congesta* DC., and the taxon that had been treated as *H. congesta* (sensu stricto) has actually never been named. Tanowitz therefore described the latter taxon as *H. leucocephala* Tanowitz.

Members of the *Hemizonia congesta* complex have been treated by Babcock & Hall (1924) as one variable species with six subspecies and by Clausen (1951) and Keck (1958, 1959, 1960) as seven species. Babcock & Hall presented strong evidence that these taxa are all more or less interfertile and that intergradation in nature is common where ranges overlap. Clausen (1951) presented a crossing polygon that confirmed that these taxa are weakly to moderately interfertile in various combinations. Nevertheless, Clausen & Keck treated these plants as distinct species. I have been unable to document their rationale for recognition of these taxa at the species level.

In the Jepson Manual, I am following Babcock & Hall in treating these taxa as one polymorphic species. I recognize the same taxa that Babcock & Hall (1924) recognized. However, because of the nomenclatural changes that resulted from Tanowitz's (1983) study, application of names has changed for some taxa. I am treating as *Hemizonia congesta* ssp. *congesta*, the taxon that Babcock & Hall (1924) called *H. congesta* var. *lutescens* (E. Greene) Babcock & Hall, and that Keck (1959, 1960) split into *H. lutescens* (E. Greene) Keck, *H. multicaulis* Hook. & Arn., and *H. multicaulis* ssp. *vernalis* Keck. The taxon that Tanowitz treated as *H. leucocephala* has no name at the subspecific level. I therefore propose the following new combination:

Hemizonia congesta DC. ssp. **leucocephala** (Tanowitz) Keil, *comb. nov.*
 BASIONYM: *Hemizonia leucocephala* Tanowitz, Bull. Torrey Bot. Club
 110:15. 1983.

ACKNOWLEDGMENTS

I thank Dr. Bruce G. Baldwin and Dr. Rhonda L. Riggins for reviewing this paper.

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